PUBLIC WORKS

Nov. 1957

CITY, COUNTY AND STATE

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Water Departments Simplify BILLING and PAYMENT pages 90 and 91

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C. E. Perkins, City Manager of Glendale, Calif., is an experienced engineer and administrator. Recently he reorganized several related public works activities in Glendale into a new Dept. of Public Works. More on page 18.

GALION MODEL 503 MOTOR GRADER...

Economical..... to buy, operate and maintain.

Versatile..... designed to do many jobs.

Compact..... easy to maneuver in restricted areas.

Efficient..... built to give top performance.

The Galion 503 has 50 h.p. engine, hydraulic controls, positive 4-wheel tandem drive and high-clearance front axle.

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Performance-boosting attachments available for the Galion 503 Grader include: Power shiftable moldboard . . . Power circle reverse . . . Leaning front wheels . . . Windrow eliminator . . . Stand-up height steel cab . . . Front-positioned scarifier . . . "V" snow plow . . . and Bulldozer.

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General and Export Offices, GALION, OHIO, U.S.A.

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Contractors find the Galion Model 503 Grader profitable for grading work on the construction of parking lots, shopping centers, streets in housing projects, maintaining haul roads on construction jobs, etc.

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TRENCH ROLLERS • PORTABLE ROLLERS • 3-WHEEL ROLLERS • TANDEM ROLLERS • MOTOR GRADERS

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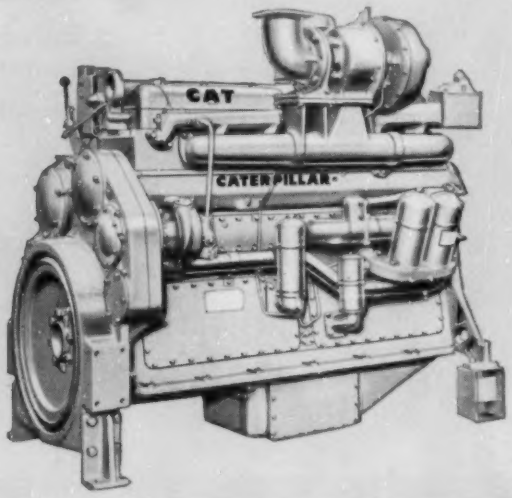
650 HP†	430 HP†		225 HP†	140 HP†	310 HP†	200 HP†	175 HP†	115 HP†	137 HP†	91 HP†	65 HP†

New D353

390 HP†



Length 75⅜"
Width 47½"
Height 69¼"

†Maximum output capacity

The engine that delivered outstanding performance in the famous D9 Tractor is now available as the D353 Industrial Engine, Electric Set and Marine Engine. Like all modern CAT* Diesels, the D353 incorporates in its design the advanced features developed by Caterpillar in a quarter century of diesel leadership. Its four-cycle design delivers the long, effective power stroke that puts power to more efficient use than other types of engines. Its fuel system requires no adjustment. There are no cylinder ports to clean. And it operates on a wide range of fuels including premium diesel fuels as well as low-cost No. 2 furnace oil *without fouling.* All these and other features add up to performance that no unit in its power class can match.

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For complete information about the new D353 and other Cat Diesels, see your Caterpillar Dealer. Let him show you how diesel leadership based on a quarter century of experience can engineer the modern heavy-duty diesels of tomorrow.

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Through the years, Caterpillar Engines have earned a reputation for *honestly rated power.* Now Caterpillar backs this reputation with a *notarized certificate* covering the horsepower capabilities of each engine. You have a right to demand *certified power* when you invest in an engine. You get it when you buy from your Caterpillar Dealer!

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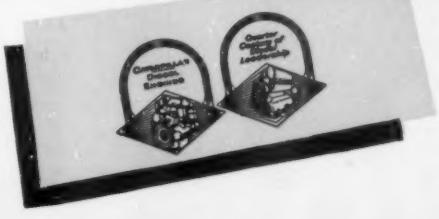

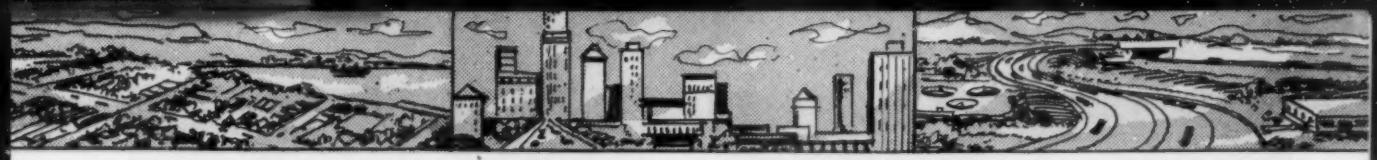

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NOVEMBER 1957

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AMPLE DEFLECTION
Photo shows how easily Clow Bell-Tite joints handle casual curves or normal grades without fittings.

TIGHT JOINTS
Full length, restrained joint, bursting tests prove Bell-Tite joint, even fully deflected, is stronger than the pipe.

FAST INSTALLATION
Above, Clow 8′ Bell-Tite pipe being installed at the rate of 25 joints per hour. No bell holes are required.

SIMPLE ASSEMBLY
Wipe clean, lubricate, and push spigot into bell. When painted yellow stripe disappears, joint is bottle-tight!

CLOW BELL-TITE JOINT*
cast iron pipe

Here's the new time-saving, labor-saving, money-saving way to lay watermain. A single gasket, rubber seal joint that requires no bolts or follower glands to make a tight, dependable joint. Listed by the Underwriters' Laboratories, Inc., for water working pressures up to 350 psi, the pipe itself meets all applicable provisions of AWWA, ASA, and Federal Specifications. Complete details gladly rushed to you on request.

*Patent applied for.

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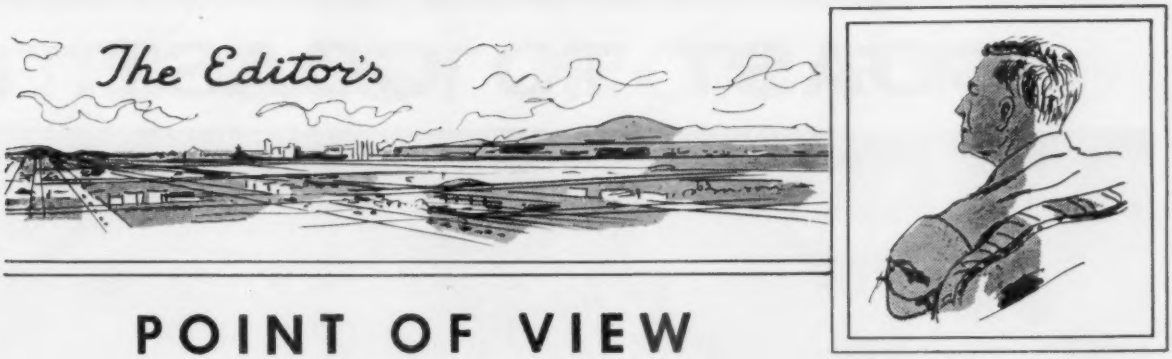


POINT OF VIEW

Research Projects Could Stand a Little Speeding Up

THE PROGRESS OF many of our research projects can be described as slow motion, though probably use of the term is sometimes unfair and is motivated by our natural impatience to know the answers. Perhaps also we, who are outside the laboratory or test area, fail to realize the many problems and questions, often unforeseeable, which arise and have to be dealt with. Also, the time requirements involved in testing are not always fully appreciated.

Nevertheless the man in charge of a project, whether he be professor or project manager, should do all in his power to get reliable results early. The fire that burned brightly when the project was born may grow very dim after a couple of years of vague and unsatisfactory progress reports. The results could be a distinct setback for research as we look at it now. A better realization of the need for vigorous prosecution and timely and informative reports is a thing to be desired.

City and County Public Health Engineers Should Look Ahead

FORESIGHT IS a great thing which not all of us have. Ability to anticipate a problem is perhaps next best for it gives time to collect data and consider the matter without immediate pressure.

Subdivision sanitation has been much in the foreground in recent years. In too many places, results have been bad, largely because the problem has popped up and there is pressure for an immediate answer. Lacking time and background knowledge, it is easier to permit septic tank installation than to start a fight, even though lot sizes are scanty and soil conditions not favorable; or the builder may be willing to bargain on lot sizes, trading a larger lot size for approval.

Cities and counties, for the most part, are not large in area and the energetic city or county public health engineer ought to be able to recognize the areas most likely to be developed; and he ought to find ways of getting early information on development projects. Armed with such information he can formulate sound and definite policies with reasons for them—whether sewers will be required; what kind of treatment is needed; or whether an existing treatment plant is within reach. Also, he ought to be a fair designer of small treatment plants so that he can determine better what can be done and how much it will cost.

With such a background of knowledge and with the mental readiness that comes from wise anticipation, he can do the kind of a job that engineers ought to do always.

Organization and Planning are Necessary Skills for the Engineer

A RECENT RESEARCH survey, results of which have been reported by the National Society of Professional Engineers, asked engineers in essence: What additional training would be most profitable to you? Of ten principal items listed, organization and planning had considerably the most votes; following rather closely were two allied subjects: How to handle people and how to supervise.

These are only a few of the many questions asked and reported on in this interesting report; but the replies are significant in showing that engineers are aware of the deficiencies that are inherent in some past and probably in some present engineering curricula.

We would like to see engineers assume a greater degree of leadership in public works, developing their organizational and planning skills further. Though we think that they are doing better in these regards than most other professions, and that they cannot justly be scolded for their accomplishments, they should never be satisfied with any existing status of knowledge or capacity.

Complaints Are Part of the Business

THE PUBLIC SERVANT is sometimes prone to identify complaints concerning his service as an unfriendly act or as an insult to his diligence. Actually, in most cases the complainer may be doing him a favor by pointing out a weak spot in his organization or his operating procedure. When the complaint is telephoned, it can be of more value than if written; more information is likely to be given; and an opportunity is afforded to acquaint the individual with the kind of service the public agency can render, clearing up many misunderstandings. A complaint can thus become an opportunity.

COAST TO COAST...

Daytona Beach, Fla.—16" flexible joint cast iron pipe being installed for water line crossing Halifax River.

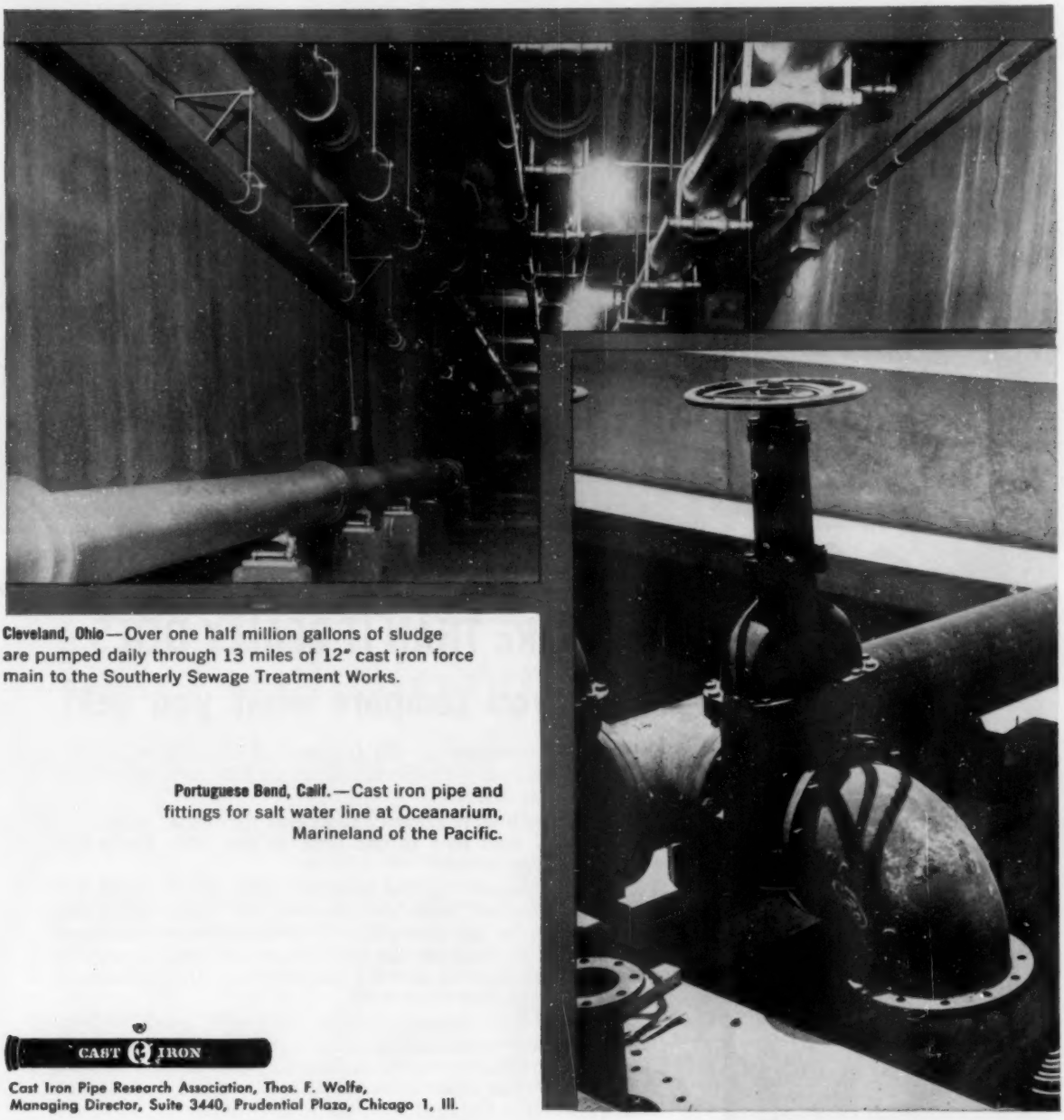
Across the nation, thousands of forward-looking communities use cast iron pipe for their water, gas and sewerage systems. For good reason! Nearly seventy American cities are still being served by cast iron mains laid over a century ago. This outstanding record for long life is unmatched by any other pipe!

What's more, the *modernized* cast iron pipe, centrifugally cast, today is even stronger, longer-lasting, more uniform.

When mains are needed, specify cast iron pipe. It's America's foremost pipe . . . for performance, dependability, economy. The record proves it!

CAST IRON PIPE

IT'S CAST IRON PIPE



Cleveland, Ohio—Over one half million gallons of sludge are pumped daily through 13 miles of 12" cast iron force main to the Southerly Sewage Treatment Works.

Portuguese Bend, Calif.—Cast iron pipe and fittings for salt water line at Oceanarium, Marineland of the Pacific.

CAST IRON

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, Suite 3440, Prudential Plaza, Chicago 1, Ill.

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You.. WOULD GUESS THIS DAVIS RIG COST MORE THAN IT REALLY DOES...

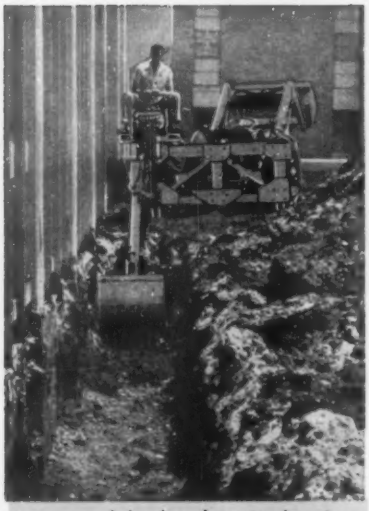
... after you compare what you get!

When you compare all the features of the Davis Loader-Backhoe with all the others, you would just naturally think it would cost more.

The truth is, it actually costs less than most other makes. And now is the time to see your Davis Dealer for a deal!

The Davis Loader-Backhoe **does** have more to offer that will save you time and make you more money. Visibility is just one. The loader has strength built in so no braces mar your vision. You sit high on the backhoe so you can see exactly where you're digging and the seat moves with the boom to let you always face your work.

Consider utility, maneuverability, strength, quick detachability, quality construction and power (with 7,000 to 10,000 pounds of breakaway on the backhoes) you will come up with the same answer that thousands of backhoe and loader users have, "Davis is the best buy, bar none." Better get in to see that Davis Dealer today!



...and look what it does!

Only the Davis 210 Backhoe can dig flush alongside of a building like this. It has three interchangeable digging positions—from either end or from the center of the frame. It utilizes an exclusive rotary hydraulic boom swing cylinder that provides 200° continuous operating arc.

Davis Loaders and Backhoes are available for all popular models of International, Ford, Fordson Major, Ferguson, Case, Massey-Harris, Allis-Chalmers, Oliver, John Deere, Work Bull and Minneapolis-Moline Tractors.

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The Law keeps its paper work in order with Recordak Microfilming!

Paper work piles up in a police department, just like in any other business. Accident reports are but one example of the 300-odd reports filed each day by the Rochester, N. Y., Police Department.

To save the most space, speed reference, maintain the necessary accuracy—the Rochester Police Department decided on Recordak Microfilming. Nineteen different types of reports are regularly microfilmed:

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- Daily Reports
- Radio Log
- Suicide Report
- Court Docket
- Report to F.B.I.
- Accident Report
- Dispatcher's Log
- Phone Calls
- Car Reports
- Teletypes
- Inspector's Report
- Report to Commissioner
- Tow Sheets
- Patrol Wagon Reports
- Missing Persons Report
- Arrest Blotter
- Report to D.C.
- Report on Stolen Autos

Once films are processed and inspected, original documents can be *destroyed!*

Result: film records take 99% less space—8-year files take less than four shallow film drawers! What's more, any item can be found in a minute or two!

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Recordak Junior Microfilmer Combines microfilmer and film-reader in one unit.

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**Based on a comparison of manufacturers' suggested retail prices*

(Background) **NEW TWO-TON** stake with your choice of Short Stroke Six or V-8's.

NEW '58 FORD PICKUP. Modern Styleside body is as wide as the cab and *standard at no extra cost!*

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Meet America's newest, most modern trucks—Ford for '58! Discover the new advances in this pace-setting line. See the important advantages that help you do your job better and at lower cost!

Then match your specific requirements against Ford's over 300 new models. Whatever your need—from half-ton pickup to heavy duty tandem—Ford's got it! And *you'll* get a truck that costs you less to own, less to run and lasts longer, too.

So see your Ford Dealer today and step ahead with America's most modern truck—built modern to cost you less.

NEW CAPACITY! Extra-wide Styleside pickup bodies have up to 41% more loadspace than others . . . *biggest loadspace per dollar!*

NEW SAVINGS! Only Ford offers this modern, extra-capacity pickup body *at no extra cost!*

NEW EASY RIDE! Scientific Impact-O-Graph ride tests prove amazing superiority of Ford over competitive pickups—a ride mighty close to that of a car!

NEW POWER! More powerful, more rugged V-8 engines! And only Ford offers Short Stroke economy in *both* Six and V-8!

'58 FORD TRUCKS—FIRST WITH THE FEATURES THAT COUNT!

FORD TRUCKS

that's new...costs less, too!

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NEW COMFORT! Only Ford truck Driverized Cabs have this comfort combination: woven plastic upholstery, non-sag seat springing, suspended pedals and weather-protected inboard steps.

NEW TILT CAB SAVING! Hundreds of dollars less than other Tilt Cabs . . . America's lowest-priced* Tilt Cab line.

The big fleets buy more Ford Trucks than any other make!

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . LAST LONGER, TOO!

"We feel that the usage of the Tractairs is nothing short of essential in our type of operation," says Aaron J. Conner (left). Backfill tamping is only one of many jobs that can be done with the Le Roi tractor-compressor.

Hoist attached to front-end loader lifts pump assembly. The rubber-tired Tractair met contract stipulation of the Selma job that "there was to be no damage to existing street surfaces" during pipe-laying.

Tractair* Cuts Work Interruptions by Two-Thirds

Each Le Roi unit "saves at least $7.00 per day," general contractor reports.

Self-propelled tractor-compressor provides on-the-job air power without costly delays.

"Since the Tractairs enable us to eliminate work stoppages involved in moving the conventional wheeled, portable compressors from one working area to another on the same job site, we save at least a full day of labor at each construction location," reports Aaron J. Conner, general contractor of Roanoke, Va., who specializes in utility construction work. That's quite a saving when you consider that he employs 20 men, working 10-hour shifts.

He adds that the cost-cutting versatility of his three Le Roi tractor-compressors pays off on highly competitive municipal construction contracts. His most recent one involves the installation of city water, gas, and sewer lines at nearby Selma, Va.

Old Method Too Costly

Conner's work requires that compressors be moved as many as 10 times a day. With ordinary equipment, each move meant a work interruption of 30 minutes during which the entire compressor crew was idle. As a result, five man-hours were wasted during a normal day. In addition, each move tied up a truck and a moving crew, creating a secondary work stoppage.

"With the mobile Tractair equipment, it takes just one man to walk to the unit, move it directly to the next working area, and set up again, all within a ten-minute period," Conner reports. What's more, the truck and its crew are released for other duties.

Conner states that the best alternate equipment available doesn't approach the Tractair for cutting costs. "Overall labor cost per job is reduced by approximately 5%," he declares. And the Tractair simultaneously "permits us to achieve standards of efficiency we could not otherwise get."

Has Many Uses

Versatility is another Tractair advantage. For example, a hoist mounted on the unit's front-end loader reduced pipe-laying time by 20%. A scoop bucket adapts the tractor-compressor for stockpiling materials and for resurfacing ditch lines. Tractair also provides air power for drilling, tamping, and for air pressure-testing of natural-gas pipe lines.

So, if outmoded equipment is cutting too deeply into your profit, it's time to get a Le Roi Tractair. Write us today for details.

T-78

*"Tractair" is the registered trademark for Le Roi's combination tractor—air compressor.

WASCO

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Newmatic air tools, Tractair,® portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

WESTOVER, NEW YORK

U. S. ARMY ENGINEERS use TYLOX Rubber GASKETS

to keep storm water INSIDE of flood control sewers

Water, even under flood pressure, can't force its way past the *compression* seal made by TYLOX Rubber Gaskets . . . a major reason why TYLOX was selected for coupling pipe of the U. S. Army Engineers' Flood Control project near Westover, N. Y. The system was designed to carry storm water to the nearby Susquehanna River, and water-tight pipe joints were a *must* to prevent undermining of land fills along the way.

TYLOX not only assured leak-proof pipe joints for the project, but "paid off" in other important aspects as well . . . *Flexible* TYLOX, for instance, cuts overall job costs by eliminating trench-work delays and speeding pipe installation. *Non-deteriorating* TYLOX virtually eliminates pipe line maintenance by protecting joints from root and sediment penetration for the life of the pipe itself.

* **PROJECT:** U. S. Flood Control Project, U. S. Army Engineers, Westover, New York.

CONTRACTOR: Buck & Donohue, Contractors, Newark, N. J.

PIPE: 42" x 8' reinforced concrete pipe, manufactured by Universal Concrete Pipe Company, (Div. of American-Marietta Company), Binghamton, New York.

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containing engineering data and showing typical TYLOX installations the world over. Read why TYLOX was specified, and take advantage of TYLOX on your next pipe project.

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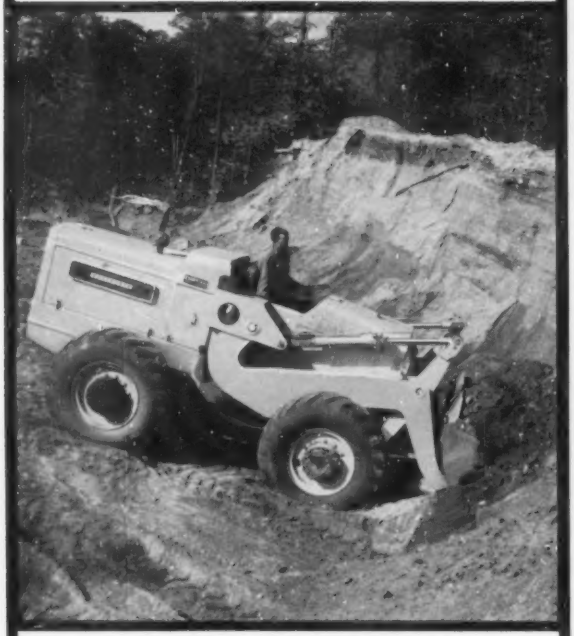

with BREAKOUT action

. . . and 40° bucket tip-back ***at ground level,*** both of which are productive features EXCLUSIVE with "PAYLOADER" tractor-shovels. They can not be found on any other rubber-tired loader.

To the user they mean that loads can be obtained easier and faster with less strain on the machine and bigger loads can be RETAINED in the bucket with the 40° tip-back AT GROUND LEVEL.

The FIRST four-wheel-drive tractor-shovels were introduced by The Frank G. Hough Company just ten years ago and many of them are still in daily use. Neither they, nor any of the numerous copies being offered are as productive as these new "PAYLOADER" models.

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you CARRY more

with CUSHIONED loads

. . . using hydraulic load-shock absorber as standard equipment on all four-wheel-drive "PAYLOADER" models, another HOUGH EXCLUSIVE.

It doesn't matter what kind of an extra big load an operator was able to get to begin with if most of it is lost in SPILLAGE while traveling.

The "PAYLOADER" load-shock absorber does not completely eliminate spilling if you are operating over exceptionally rough surfaces . . . but it does minimize the loss and enable you to RETAIN more.

This is just one more reason why these new "PAYLOADER" tractor-shovels are more productive and why the combination of all the features which only Hough-designed units offer the user make "PAYLOADER" a better buy than any other equipment.

If you are not familiar with these new models your "PAYLOADER" distributor will be glad to demonstrate them to you.

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

11-B-1b

you DELIVER more

with NO STOP for shifts

. . . which the "complete" power-shift transmission of these "PAYLOADER" units provides by saving time and effort.

There is no need to bring HOUGH tractor-shovels to a stop for a "range" shift. All shifts in both forward and reverse can be made "on the go".

When you travel over muddy or slippery terrain, "power-transfer" differentials automatically transfer more power to the wheels with the best footing. This is another STANDARD on all four-wheel-drive "PAYLOADER" tractor-shovels.

Therefore, if you GET more at the start, if you SPILL less during travel, if you can travel faster with NO STOPS for shifting and better traction . . . you are going to be able to ***deliver*** MORE . . . and, after all, that's what counts.

Only "PAYLOADER" tractor-shovels have all of these PRODUCTIVE features which spell more PROFITABLE operations for the user.

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

11-B-1e

you GET more

with GREATER choice

. . . of any and all kinds of financing.

What best fits your needs?

Do you want to purchase on a ***time payment*** plan? Your "PAYLOADER" distributor can offer you such a plan tailored to various periods to suit your needs.

Do you want a ***leasing plan**** with an ***option to purchase?*** He has a number of these which can be adapted to fit your requirements and preferences.

Do you want a straight ***leasing plan**** without a purchase option? He can provide "PAYLOADER" equipment for your operations on a straight leasing plan.*

Your distributor of "PAYLOADER" machines now has at his disposal the broadest and most complete set of financing plans and arrangements being offered.

He will be glad to discuss your needs for the finest equipment and offer you the greatest choice of terms. He will consider trade-ins.

He'll even take cash!

Consult him at once.

*(available in the continental U.S.A.)

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

11-B-1d

NOW AVAILABLE
EXPANSION and CONSTRUCTION JOINTS
DURAJOINT and DURASEAL WATERSTOPS
Polyvinylchloride
for water-tight expansion and construction joints in concrete structures

DURAJOINT PVC WATERSTOPS

TESTED . . . ® and proven BEST!

Test after test, made by various independent research organizations, conclusively prove that DURAJOINT Waterstops are the only waterstops available on which you can stake the safety of your design and reputation. The results of these tests plus the many other advantages offered by DURAJOINT Waterstops are concisely stated in our new Waterstop Manual No. 457. Check and mail the coupon below for your free copy . . . it will make an excellent addition to your waterstop file.

DURAJOINT TECHNICAL INFORMATION *Center*

121 HILL AVENUE • AURORA, ILLINOIS

DEPT. 24

Gentlemen:

☐ Please send me, without obligation, a copy of Manual No. 457.

☐ Have Representative call.

NAME_____

FIRM_____

ADDRESS_____

CITY_____ STATE_____

LEADER IN PUBLIC WORKS

C. E. Perkins is City Manager of Glendale, California (population 117,000) and is a registered Civil Engineer. He was formerly City Manager of Columbia, Mo., and Winston-Salem, N.C. He was graduated from the University of Kansas with a BSCE in 1927; later he was awarded the degree of Civil Engineer from that institution. His engineering experience includes employment with Burns and McDonnell; Service as Assistant Professor of Civil Engineering at Oklahoma A & M College; Manager of the Bartlesville Water Company; and District Manager for the Public Service Company of Oklahoma.

During World War II, he joined the Sanitary Corps of the Army, was graduated from the Civil Affairs Training School at Stanford University, and assigned to the Corps of Engineers as "Public Works and Utilities Specialist", working with the Civil Affairs and Military Government forces in Europe. He now holds the rank of Lieutenant Colonel. Following military service, he was with Trans-World Airlines as Director of Route-Development and State Affairs from which position he entered the field of city management.

Memberships include ASCE, American Military Engineers, International City Managers' Association, American Society for Public Administration and Kiwanis. He is listed in "Who's Who in Engineering." The City of Glendale recently received an award from the American Society for Public Administration for "Outstanding Administrative Performance in Municipal Organization."

DESIGNED, FABRICATED AND ERECTED BY

GRAVER®

T
222

FILE REFERENCE

FACT SHEET

GRAVER®

Elevated Water Tank for United States Air Force Dover AFB, Delaware

U. S. Army Corps of Engineers
In charge of base construction

Frederick Raff Co., Inc.
Engineers and Contractors
Hartford, Conn.

Graver Tank & Mfg. Co., Inc.
Design, Fabrication and Erection

Type: Double Ellipsoidal Elevated Tank
Capacity: 250,000 gallons
Height to Overflow: 149′
Low Water Level: 120′
Diameter of Tank: 40′
Built to AWWA Specifications
Aircraft warning painting and warning lights in accordance with CAA regulations
Sterilized and Cathodic Protected

THE PROBLEM

Several years ago the relatively small Dover Air Force Base was re-activated with a long range plan for developing it for the use of the Military Air Transport Service. It became obvious that the greatly enlarged activity together with its housing projects would require an adequate water supply system independent from that of the neighboring city of Dover, Delaware.

THE SOLUTION

A thorough study was undertaken by United States Air Force authorities with the consulting services of the Army Corps of Engineers and Frederick Raff Co., Inc. Present and future water requirements were determined and coordinated with the overall construction program. Plans were developed for new wells, larger mains and adequate pumping and storage capacity.

It was determined that an elevated water tank with a capacity of 250,000 gallons was required. After the basic specifications were determined, Graver Tank and Mfg. Co., Inc. was selected to design, fabricate, erect and sterilize the double ellipsoidal tank.

The entire project, from planning through final inspection, required close teamwork between Graver engineers and field crews, the contracting engineers and the Armed Services.

Base your water storage plans on competent advice. Discuss your problems with a consulting engineer and with Graver, whose recommendations are backed by a full century of tank fabricating and erecting experience.

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA

New York • Philadelphia • Edge Moor, Delaware
Pittsburgh • Detroit • Chicago • Tulsa • Sand Springs, Oklahoma • Houston • New Orleans • Los Angeles • San Francisco • Fontana, California

Our 100th Year

SURGEABILITY...

THE LATEST WORD IN WATER TREATMENT

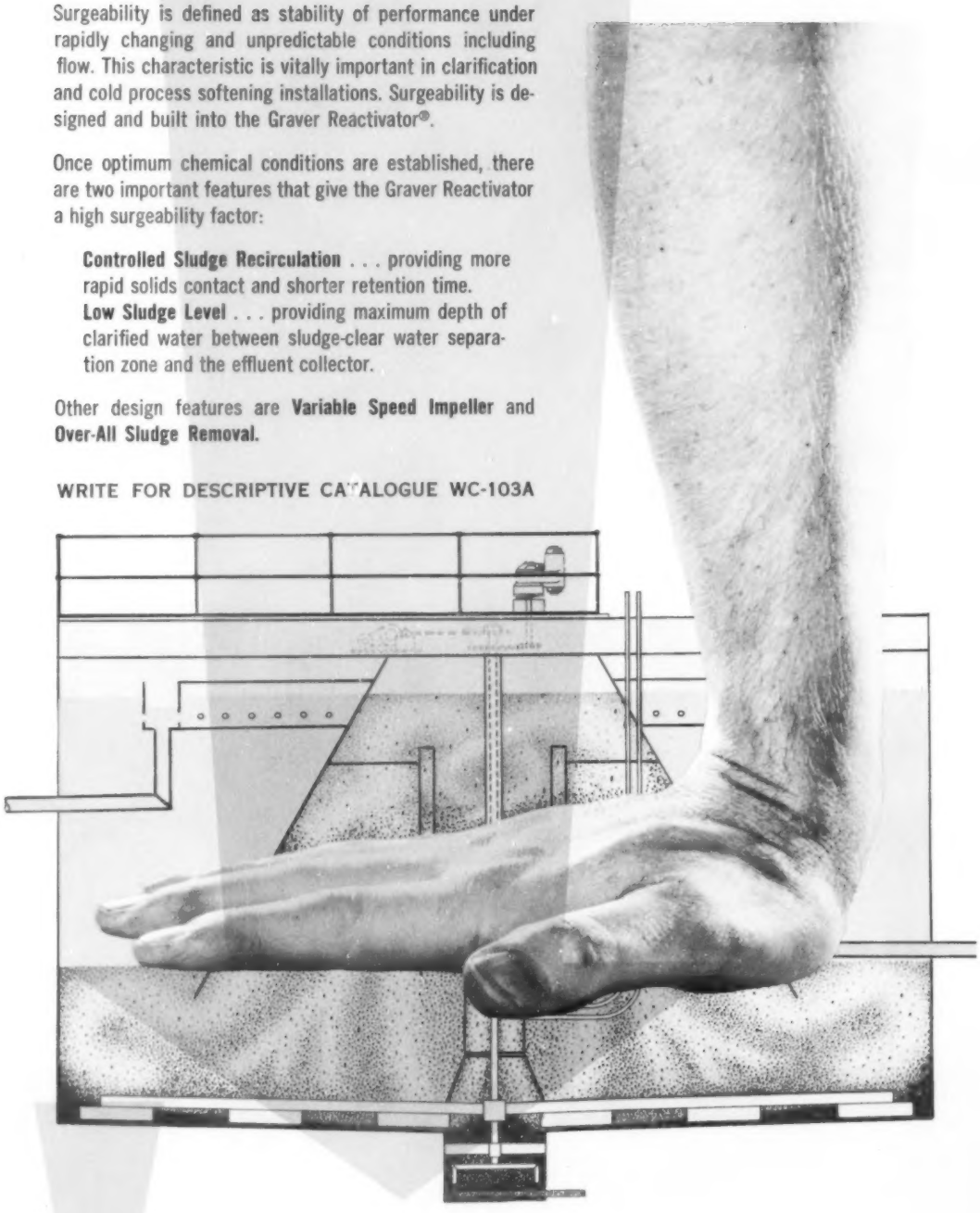
Surgeability is defined as stability of performance under rapidly changing and unpredictable conditions including flow. This characteristic is vitally important in clarification and cold process softening installations. Surgeability is designed and built into the Graver Reactivator®.

Once optimum chemical conditions are established, there are two important features that give the Graver Reactivator a high surgeability factor:

Controlled Sludge Recirculation . . . providing more rapid solids contact and shorter retention time.
Low Sludge Level . . . providing maximum depth of clarified water between sludge-clear water separation zone and the effluent collector.

Other design features are **Variable Speed Impeller** and **Over-All Sludge Removal.**

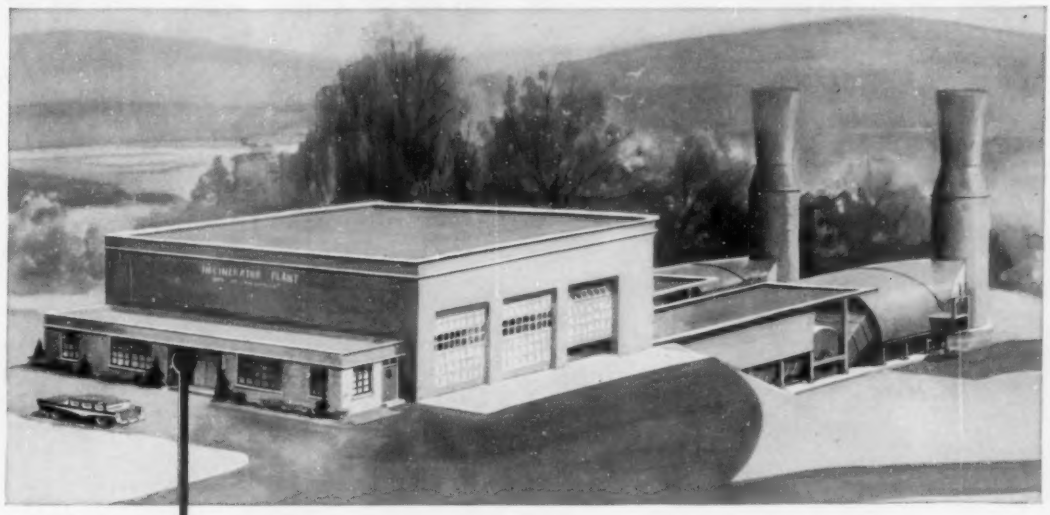
WRITE FOR DESCRIPTIVE CATALOGUE WC-103A



GRAVER

Department NK

GRAVER WATER CONDITIONING CO.
A Division of Graver Tank & Mfg. Co., Inc.
216 West 14th Street, New York 11, N. Y.



THIS NEW KIND OF INCINERATOR GIVES ALL THESE ADVANTAGES

1. Economical to build and operate.
2. Attractive to the eye.
3. Virtually eliminates all smoke, odor or fly ash discharge.
4. Continuous in operation. Loaded trucks are emptied immediately upon arrival at plant. Rubbish is at no time accumulated outside.
5. Reduces costs of collection because refuse does not have to be separated, trucks do not wait to be unloaded, and cleanliness of plant permits central location where haulage distance is shortened.
6. Employs a water-wall furnace, therefore is not subject to the inconvenient and costly shutdowns of incinerators having refractory-wall furnaces.
7. Completely consumes all combustible refuse, including garbage and sewage sludge.

Plants are constructed in units with capacities of from 1 to 40 tons per hour. Inquiries are invited from industries and institutions, as well as as municipalities.

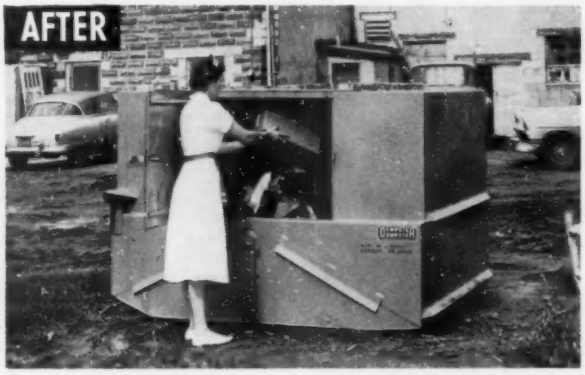
ENGINEERING INCINERATION & POWER CO.

INCINERATION ENGINEERING & POWER CO.

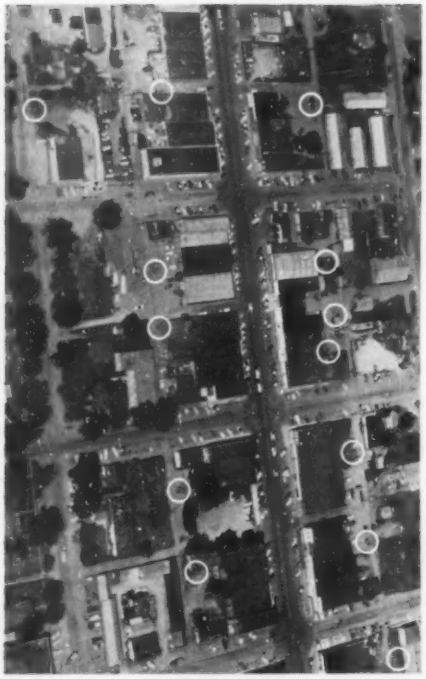
A Division of Coastal Oil Company

744 Broad Street, Newark 2, New Jersey

LOOK at LINDSAY!



Fast-Growing Oklahoma City of 4100 Cleans Up Downtown Alleys in One Day!

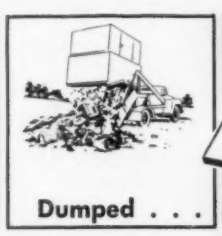


One-Man, One-Truck Dempster-Dumpster System Handles Downtown Rubbish Collection

"Lindsay never looked like this before!" "Finest improvement in the history of our city!" These are typical of the many comments made by proud citizens, Mayor W. D. Stephens and other officials after the Dempster-Dumpster System was recently installed in progressive Lindsay, Oklahoma.

From coast to coast, progressive, cost-conscious municipalities are turning to Dempster-Dumpster containers for clean-ups of business districts, apartment or housing projects and even local industrial plants. Once rubbish is placed in the clean, big-capacity containers, rats and flies can't get in . . . odors can't get out . . . wind can't scatter it. Best of all, with one truck-mounted Dempster-Dumpster and one driver, you can save up to 25 cents per cubic yard on collection costs. The average installation pays for itself in less than 36 months. Write today for a free survey; there is no obligation.

Write Today
For Details of Our New Lease-Purchase Plan
DEMPSTER BROTHERS, Knoxville 17, Tenn. Dept. PW-11



HERE'S LOADER MOBILITY . . . EXCAVATING STRENGTH

LOADS 1½ CU YD AT A PASS . . . 2¼ yd with light materials bucket. Lifts up to 11,200 lb.

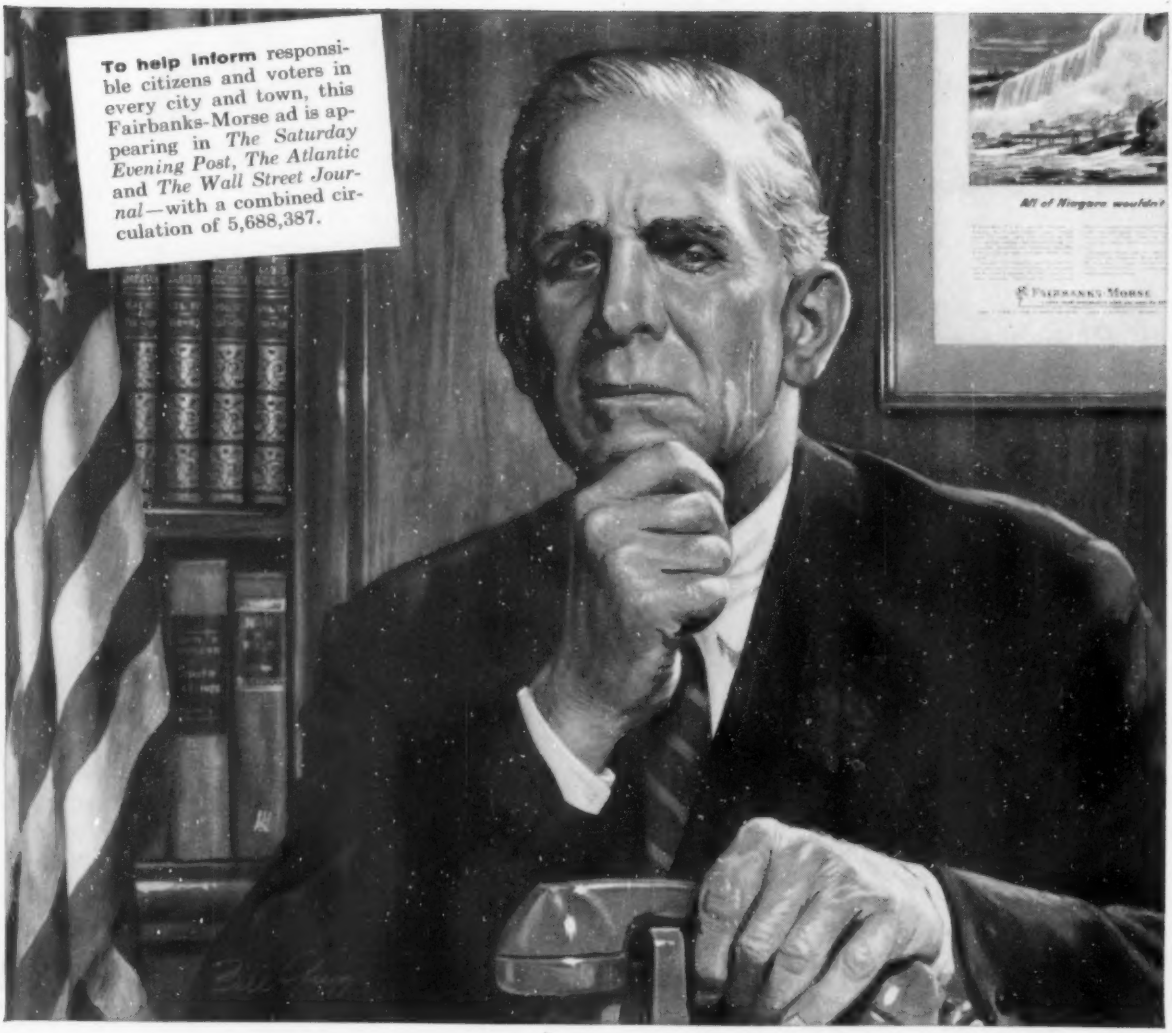
WORKS RIGHT UP ON A STOCKPILE where wheels dig in. Can build stockpiles higher, store many more yards of material in a given area.

TURNS IN ITS TRACKS . . . where many smaller loaders have to jockey.

DIGS INTO HARD-PACKED MATERIAL . . . exerts 20,000-lb break-out force, with 72 net engine hp and modern bucket design.

These are just four examples of how an Allis-Chalmers HD-6G tractor shovel offers a combination of strength, traction, flotation and mobility that enables it to replace a fleet of part-time specialized machines. You can count on it to boost production the year round. Ask your Allis-Chalmers dealer about the HD-6G . . . also the three larger tractor shovels with capacities up to 4 cu yd. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS *Engineering in Action*


To help inform responsible citizens and voters in every city and town, this Fairbanks-Morse ad is appearing in The Saturday Evening Post, The Atlantic and The Wall Street Journal—with a combined circulation of 5,688,387.

His Honor, the Mayor, is worried

His Honor is worried. Insufficient water is drying up his town's future. Industries are hampered; fire protection is a question; new school programs are in jeopardy; outside industries are rejecting it as a new plant location . . . there are times when lawn sprinkling and car washing must be prohibited.

The Mayor is worried because he knows water rates are based on the costs of materials, machinery and construction of many years ago—that the time to enlarge water supply and distribution facilities is *now*, before these costs grow even higher.

As a citizen you also should be worried. You can aid your city officials by understanding the problem and supporting your mayor's efforts to finance needed expansions. Don't let lack of water stagnate your way of life and your town's future.

Interested citizens and city officials are invited to write Fairbanks, Morse & Co., 600 South Michigan Ave., Chicago 5, Illinois, for a copy of "Your 1100 Gallons," a timely booklet on what every citizen should know about water shortage problems.

PUMPS FOR	
☒	MUNICIPAL SERVICE
☒	INDUSTRY
☒	HOME
☒	AGRICULTURE

Fairbanks-Morse, the biggest name in pumps, provides pumps and power for every water need.

FAIRBANKS-MORSE
a name worth remembering when you want the BEST

PUMPS • SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • RAIL CARS • HOME WATER SERVICE EQUIPMENT • MAGNETOS

Announcing the most revolutionary development

Fastest Cycle Ever!
25% Greater Loads!

Now with the

LOAD-PACKER® 500

Start reloading in 4 seconds after cycle starts, thanks to Cyclomatic Packing! For the first time on any unit, rotary panel is designed only to clean hopper . . . packing panel is designed only to pack. Loading is faster, more efficient. Complete cycle takes only 10 seconds.

25% greater loads in competitive Sanitary Department tests in major cities. Full-width packing panel, powered by dual 7-inch cylinders, exerts up to 81,000 pounds of force. Packs with a single direct thrust at floor level.

20% more hopper capacity with big 1½-cubic-yard hopper. Full 75-inch opening and exceptionally low loading height make crew's job easier than ever before. Get all the facts by calling your Gar Wood - St. Paul truck equipment distributor. Or write to: Customer Service Dept., Gar Wood Industries, Inc., Wayne, Michigan.

GAR WOOD INDUSTRIES, INC.
Wayne, Michigan • Richmond, California

START RELOADING IN 4 SECONDS!

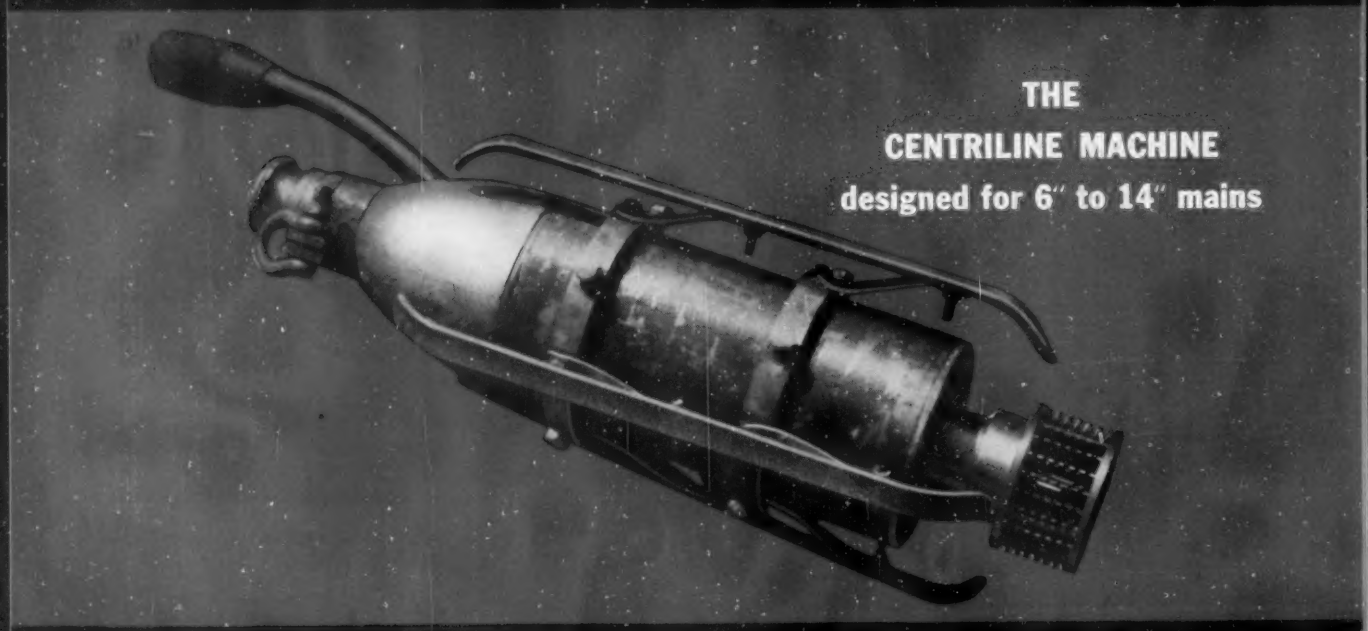
1½-cubic-yard hopper is cleared for reloading in just 4 seconds after cycle starts. Complete cycle takes only 10 seconds. Combination of fast cycle and big hopper results in faster loading than ever before.

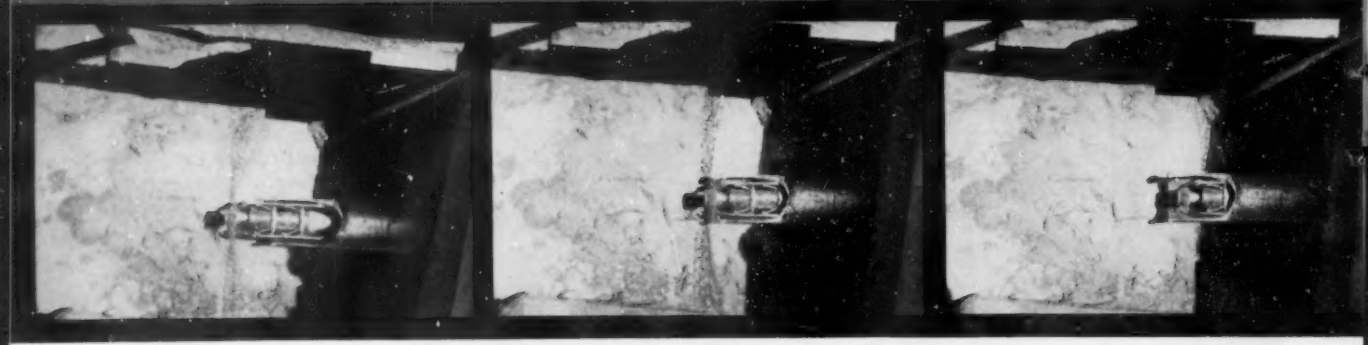
GarWood

in the water works field in the past 15 years!

Announcing the most revolutionary development

NOW! THE CENTRILINE PROCESS



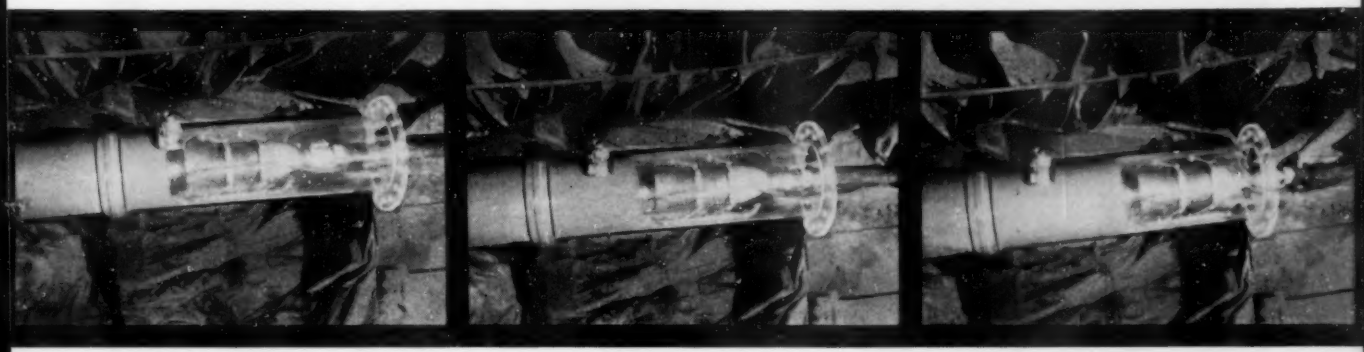


STRIP PHOTO • TOP: *Cross section view, in special transparent pipe, showing new small size Centriline machine in action being pulled through the pipe from left to right. Note the uniformity of the cement-mortar lining.*

STRIP PHOTO • BOTTOM: *View of machine at work in special cut away pipe illustrating centrifugal application of the cement-mortar.*

in the water works field in the past 15 years!

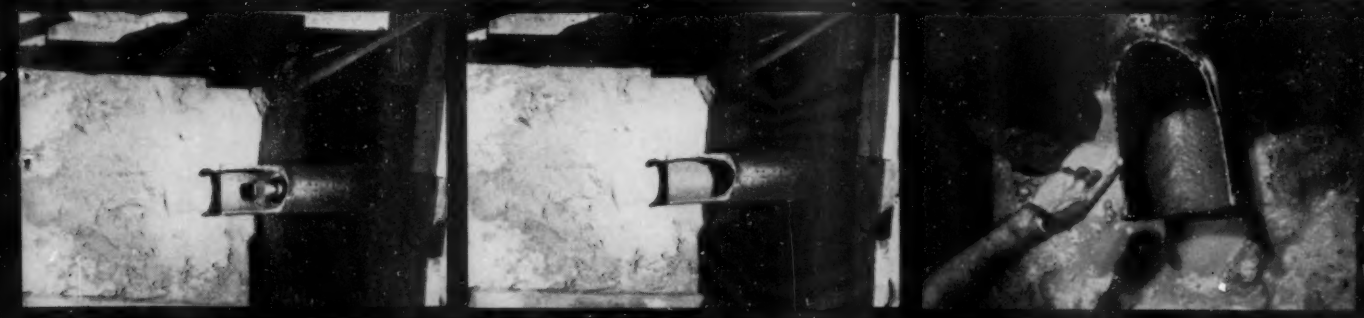
is also available for 6″ to 14″ mains



NOW, for the first time, your city's small but important transmission and distribution lines, including those used for fire protection, can regain their original flow capacity and pressure through the famous Centriline Process. A smaller version of the Centriline machine has been developed for use in 6″ to 14″ mains.

Here is how Centriline rehabilitates water systems' distribution grids. First, the pipes are cleaned to remove all tubercules, scale and loose materials resulting from corrosion. The Centriline machine is placed in the pipe and mortar is forced into a rapidly revolving head which applies a uniform coating on the pipe wall by centrifugal force. The thickness of the lining can be regulated by careful control of the machine. All of this is accomplished with a minimum of interruption to surface traffic, since the pipes are lined in place!

The advantages of using the new, small diameter Centriline machine in your mains are numerous. The new machine has a design feature which eliminates most excavations at valves, laterals and corporation cocks. The cost is lower than ever before. In addition, Centrilining permanently prevents future tuberculation, corrosion or leakage . . . reduces maintenance and pumping costs . . . raises distribution pressures and efficiency and extends the life of steel or cast iron pipe indefinitely. Send today for your free copy of our illustrated booklet which fully describes how Centriline can help you salvage worn out water lines of every size.



CENTRILINE CORPORATION

A Subsidiary of Raymond Concrete Pile Company

140 Cedar Street
New York 6, N.Y.
WOrth 2-1429

Branch Offices in Principal Cities of the United States, Canada and Latin America

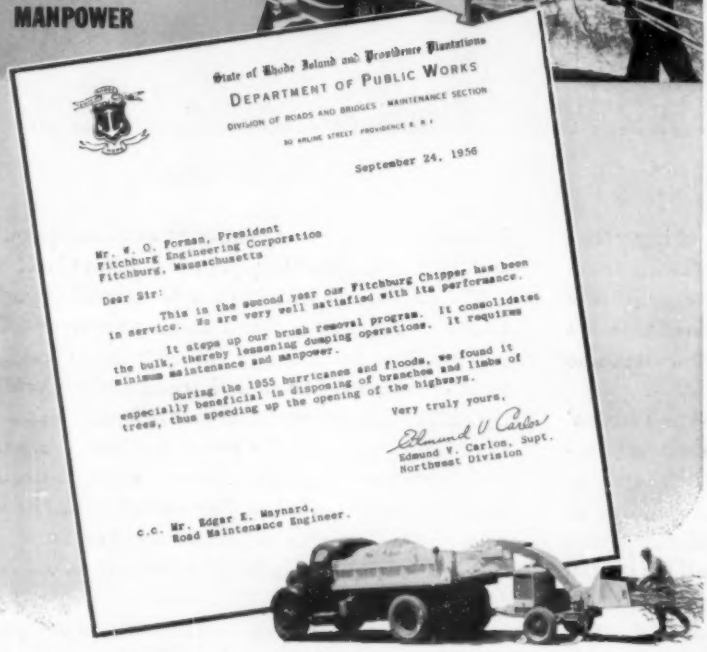
FITCHBURG CHIPPER STEPS UP
Rhode Island Brush Removal

...CONSOLIDATES THE BULK

...LESSENS DUMPING OPERATIONS

...REQUIRES MINIMUM MAINTENANCE

...REDUCES MANPOWER



State of Rhode Island and Providence Plantations
DEPARTMENT OF PUBLIC WORKS
DIVISION OF ROADS AND BRIDGES MAINTENANCE SECTION
80 ARLINE STREET PROVIDENCE R. I.

September 24, 1956

Mr. W. O. Forman, President
Fitchburg Engineering Corporation
Fitchburg, Massachusetts

Dear Sir:

This is the second year our Fitchburg Chipper has been in service. We are very well satisfied with its performance.

It steps up our brush removal program. It consolidates the bulk, thereby lessening dumping operations. It requires minimum maintenance and manpower.

During the 1955 hurricanes and floods, we found it especially beneficial in disposing of branches and limbs of trees, thus speeding up the opening of the highways.

Very truly yours,

Edmund V. Carlon, Supt.
Northwest Division

c.c. Mr. Edgar E. Maynard,
Road Maintenance Engineer.

Brush disposal cost can be reduced.

Your City will find that the Fitchburg Wood Chipper is money-saving equipment in your Highway or Park Departments. Tree trimmings are quickly reduced into load-saving wood chips. Fewer loads cuts your loading and hauling expenses. Brush removal becomes a faster, simpler, less expensive operation.

Fitchburg Wood Chippers are engineered to stand hard use, to give long service without excessive maintenance costs. There is only one Wood Chipper on the market today with a One Year Guarantee...The Fitchburg Wood Chipper.

Send for a copy of "Chipper Talk." Just clip the coupon.

Free Portfolio "CHIPPER TALK"
Complete specifications. Copies of letters from municipalities, commissions, counties, contractors, tree care men.

FITCHBURG ENGINEERING CORPORATION
Fitchburg, Massachusetts, Dept. PW-117
Send my free copy of "Chipper Talk" to:

Name _____

_____
(Position or Company)

Address _____

City _____ State _____

FITCHBURG ENGINEERING CORPORATION
FITCHBURG, MASSACHUSETTS

THE WATER WE DO NOT USE

I have read with much interest an article in your September 1957 issue by Guy Browing Arthur entitled "The Water We Do Not Use." This is a very interesting and timely article. Incidentally, in Nassau County, we are among the pioneers of twenty years ago whose officials realized the wisdom of conserving its ground water supply by installing large acreage recharge basins where storm water run-off which would otherwise be discharged into streams and eventually into tide water is put back into the ground. About 400 recharge basins have been constructed in Nassau County over the years with successful performance.

W. Fred Welsch
Senior Hydraulic Engineer
Department of Public Works
Nassau County, Mineola, N. Y.

***Ed Note's** Mr. Welsch enclosed with his letter a bibliography of articles on ground water recharge on Long Island and related hydrologic references. It is possible that he can make a limited number available to those interested in this field.*

OFFICES FOR THE WATER DEPARTMENT

In your August 1957 edition under caption—"Point of View", you raise the question . . . "Where to Locate that New Office for the Water Department". It appears that the question is basically involved in bill payment locations.

The City of Baltimore for many years has had a very satisfactory solution to this problem. We have over 100 locations in Baltimore and in the surrounding Metropolitan area where not only water bills but Real Property, Tangible Personal Property—in fact all bills rendered by the Mayor and City Council of Baltimore—are collected and receipted for and at no cost to the taxpayer.

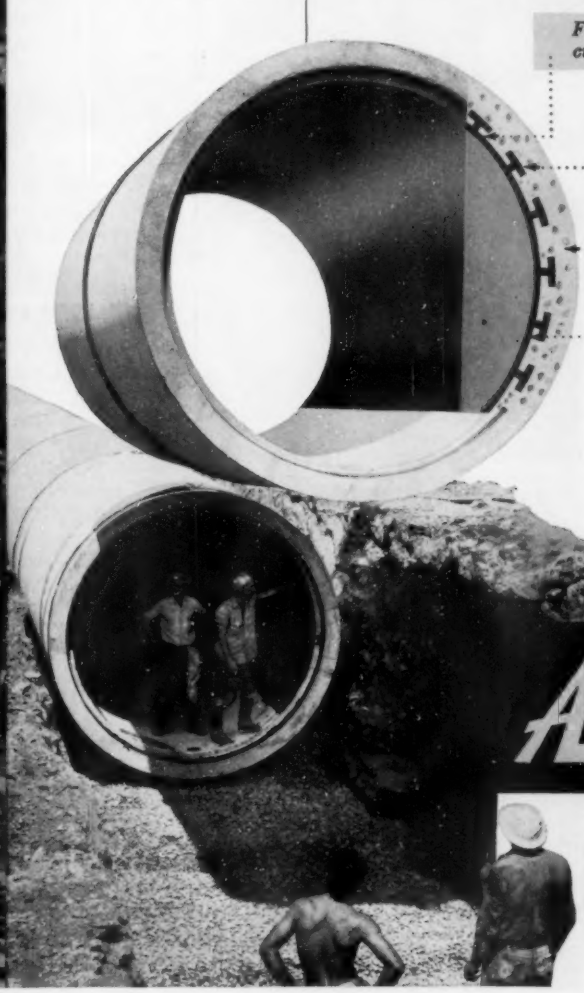
Our arrangements are with banks

precast reinforced concrete pipe with...

locked-in protection

T-Lock Amer-Plate liner provides unequaled protection against corrosive acids, salts and alkalies and has proved to be impervious to high concentrations of hydrogen sulfide sewer gas.

The criterion by which a product is inevitably judged is its acceptance by the consumer. The Los Angeles Board of Public Works has awarded contracts for Precast Reinforced Concrete pipe, protected by T-Lock Amer-Plate, for their large diameter main trunk sewer installations. Thus, this community can be assured of trouble free service, economical maintenance and maximum life in these lines. The long recognized qualities of strength and durability in Precast Reinforced Concrete Pipe plus the added proven protection afforded by corrosion resistant T-Lock Amer-Plate are a sure guarantee of permanence and economy. Specify T-Lock Amer-Plate for your municipal or industrial sewer system and be confident that you are choosing the best.


Flexible sheets fit straight or curved surfaces, corners, etc.
Extruded T's, ⅝" high, anchor lining in concrete
Concrete poured in form
.060" thick, with dark glossy surface

The Precast Reinforced Concrete Pipe shown being installed here has been poured with the tough, non-porous vinyl plastic liner, T-Lock Amer-Plate. In the manufacturing process the Amer-Plate is wrapped around the inner form so that when the concrete wall is poured the T-shaped flanges are locked into the pipe wall. An unbroken, smooth lining is established very simply by heat-welding the material to itself at the pipe joints.

"Our Fiftieth Year"

American PIPE AND CONSTRUCTION CO.

Mail address:
Box 3428 Terminal Annex
Los Angeles 54, Calif.

Main office and plant:
4635 Firestone Blvd., South Gate, Calif.
Phone LOrain 4-2511

District sales offices and plants:
Hayward and San Diego, Calif.
Portland, Ore. Phoenix, Ariz.

District sales representatives:
Seattle and Spokane, Wash.

JACKSON VIBRATORY COMPACTORS

TERRIFIC TIME SAVERS ON ALL THESE APPLICATIONS:

BLACKTOP PAVEMENT PATCHING

The manually guided Jackson Vibratory Compactor delivers up to 4200 3-ton blows per minute, is self-propelling and will compact bituminuous mixes in 5" layers close to maximum density at the rate of 1,200 sq. yds. per hour. Operated from a power plant mounted on an auto trailer with device for quickly picking up and lowering the compactor, this is positively the most advantageous outfit ever offered for patching blacktop pavement, paving drives, walks etc.

It's equally efficient in compacting granular soils in bridge approaches, water, sewer and gas mains and laterals, sub-bases of pavement widening projects, sub-bases of concrete floors, in trenches (interchangeable bases from 12" to 26" available), and dozens of similar applications. 100% of specified density is readily achieved in 10" layers. The Power Plant is fully capable of operating two of these compactors simultaneously and in many instances labor costs can be cut in two by use of the twin-unit shown at right.

For consolidating base courses of rock, slag, gravel and sand in water-bound and penetration macadam construction the Jackson Multiple Compactor is indeed outstanding. It is used on practically all of the important paving jobs in the nation. By all means write for the complete facts.

TWIN UNIT ▲
DOUBLES PRODUCTION

BACKFILL TAMPING ▼

CAMPACTING IN TRENCHES, ETC. ▼

MACADAM CONSTRUCTION ▼

JACKSON
VIBRATORS, INC.
LUDINGTON, MICH.

—many of whom have 25 to 35 branch banks in the suburban shopping areas. The banks and their branches realize that by performing this service, they can acquaint the public with all the other bank services they would like the public to learn about. I am sure that during the past 5 years there has not been one new branch bank opened that did not first request the privilege of collecting our bills.

At this moment Baltimore County is planning to open 35 bank collection points throughout the county starting about December 15, 1957.

William M. Kinnersley, Jr.
Superintendent of Receipts
Baltimore, Md.

ASSESSMENTS FOR STORM DRAINAGE

Please send me such information as you have regarding standard methods of establishing storm drainage areas and boundaries for assessment purposes.

E. L. Miller,
Director of Public Works,
Pompano Beach, Fla.

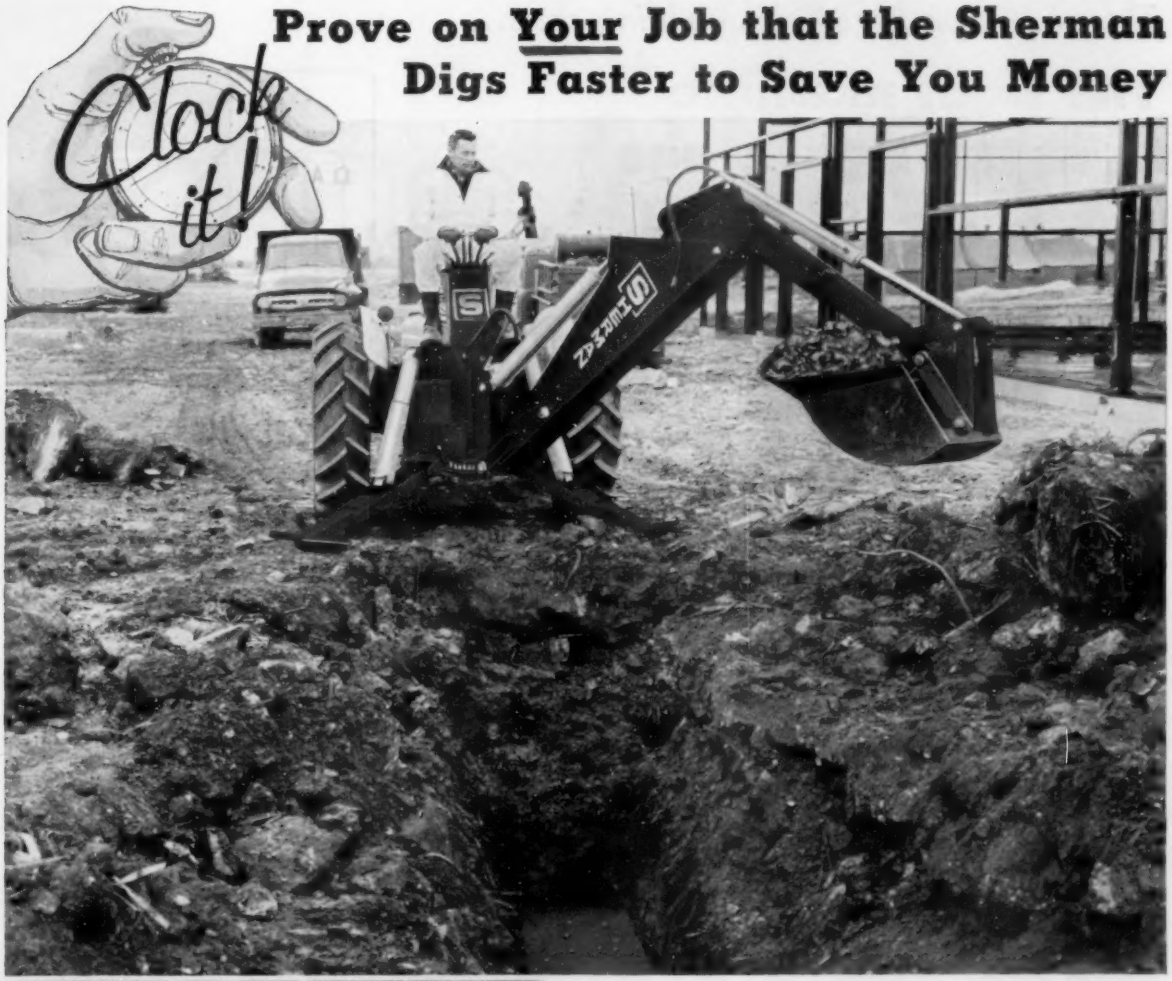
Note to Readers: Please send available information to Mr. Miller and a letter summarizing practices in your area to the Editor of Public Works, 200 So. Broad St., Ridgewood, N. J. Such data will be helpful to many cities.

• • •

ASCE Elects Officers

LOUIS R. HOWSON of Chicago has been elected president of the American Society of Civil Engineers succeeding Mason G. Lockwood. Vice-Presidents elected are WALDO G. BOWMAN, of New York, Editor of Engineering News-Record, and SAMUEL B. MORRIS, of Los Angeles, former General Manager of the Los Angeles Department of Water and Power and a consulting engineer. Six new Directors were elected: Prof. Weston S. Evans, Orono, Maine, Head of the Department of Civil Engineering, University of Maine; Craig P. Hazelet, Louisville, Ky., partner in Hazelet and Erdal; Donald H. Mattern, Knoxville, Tenn., Chief, Project Planning Branch, TVA; John E. Rinne, San Francisco, Engineer, Standard Oil Co. of California; Philip C. Rutledge, of New York, partner in Moran, Proctor, Mueser and Rutledge; and Tilton E. Shelburne, Charlottesville, Director, Virginia Council of Highway Investigation and Research.

Prove on Your Job that the Sherman Digs Faster to Save You Money



The recently introduced Model "F" Sherman Power Digger excavates faster than any comparable backhoe!

Hard to believe? Well, don't take our word for it. We challenge you to "Clock it"! Ask your Ford Tractor Dealer to demonstrate the new Sherman on *your* job while you time it with a stopwatch. Prove to yourself that it saves you money by producing more work per dollar invested in time, equipment, maintenance and manpower.

If you are interested, we'll be glad to tell you of the many revolutionary features which contribute to the digging speed and durability of the new Model "F". Just drop us a line for Bulletin No. 570.

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Sherman Products®

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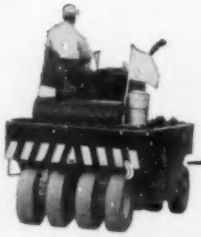
The answer to lower roadbuilding costs...

The right machine at the right stage

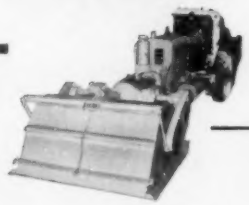
BROS SELF-PROPELLED ROLLER

Sealcoat, surface and subbase compaction work accomplished in fastest time possible with the BROS SP-54 roller. Infinite speed range from 0 to 18 MPH, both forward and reverse; torque converter drive; full oscillation of ALL wheel pairs; positive chain drives to both rear wheel pairs; engine, gasoline (or diesel) produces 50 usable horsepower at 2000 RPM; smooth automotive-type hydraulic steering.



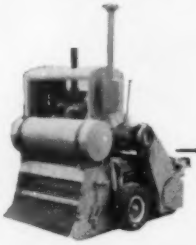
BROS ROTO-MIXER

In-place mixing and blending of surface, subbase and subgrade materials to 12″ depth with heavy duty BROS Roto-Mixer. Solid steel rotor shaft; positive equally loaded chain drives to both ends of shaft; simplified split-sleeve type tool plates. Hood and rotor each power hydraulically controlled.



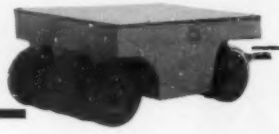
BROS PREPARATOR

In-place reduction of subbase aggregates from over-size pit or bank-run materials. Reduces up to 400 cu. yds. per hour to acceptable gradation percentages. Also prepares scarified asphalt materials to proper sizes for re-use.



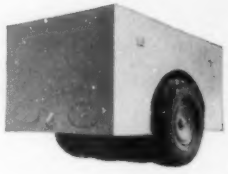
BROS TOW-TYPE ROLLERS

For surface and subbase and shallow lift subgrade compaction. 9 and 13 ton capacities; ½″ overlapping wide face tires for full coverage; full oscillation of all wheels. Wobble-wheel* action adds side-to-side weaving motion to knead out voids and material bridging.



BROS ROLL-O-PACTOR

35, 50 to 100-ton. Heavyweight champion for compacting subgrade, earthfills, airfields and dams in lifts up to 24″. 19° wheel oscillation. Tire pressures up to 150 psi. Heavy duty wheel assembly and bearings.



BROS TAMPING ROLLERS

For subgrade and embankment constructions of non-granular soils. Capacities range from 133 to 725 psi foot pressures. Sheepsfoot and Diamondfoot. Large tamping face and relief shank design provide maximum compaction pressure with the least drag when rolling at all depths. Get full information and specifications on any of these machines from your nearest BROS Distributor or write us.

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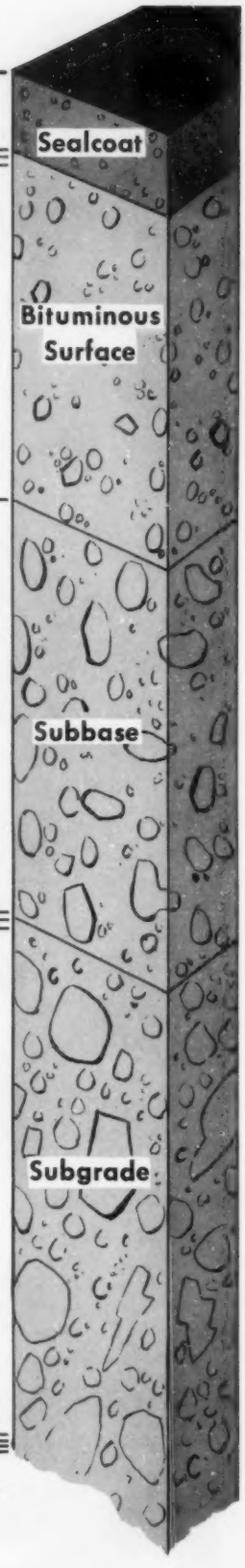

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Road Machinery Division

BROS *Incorporated*

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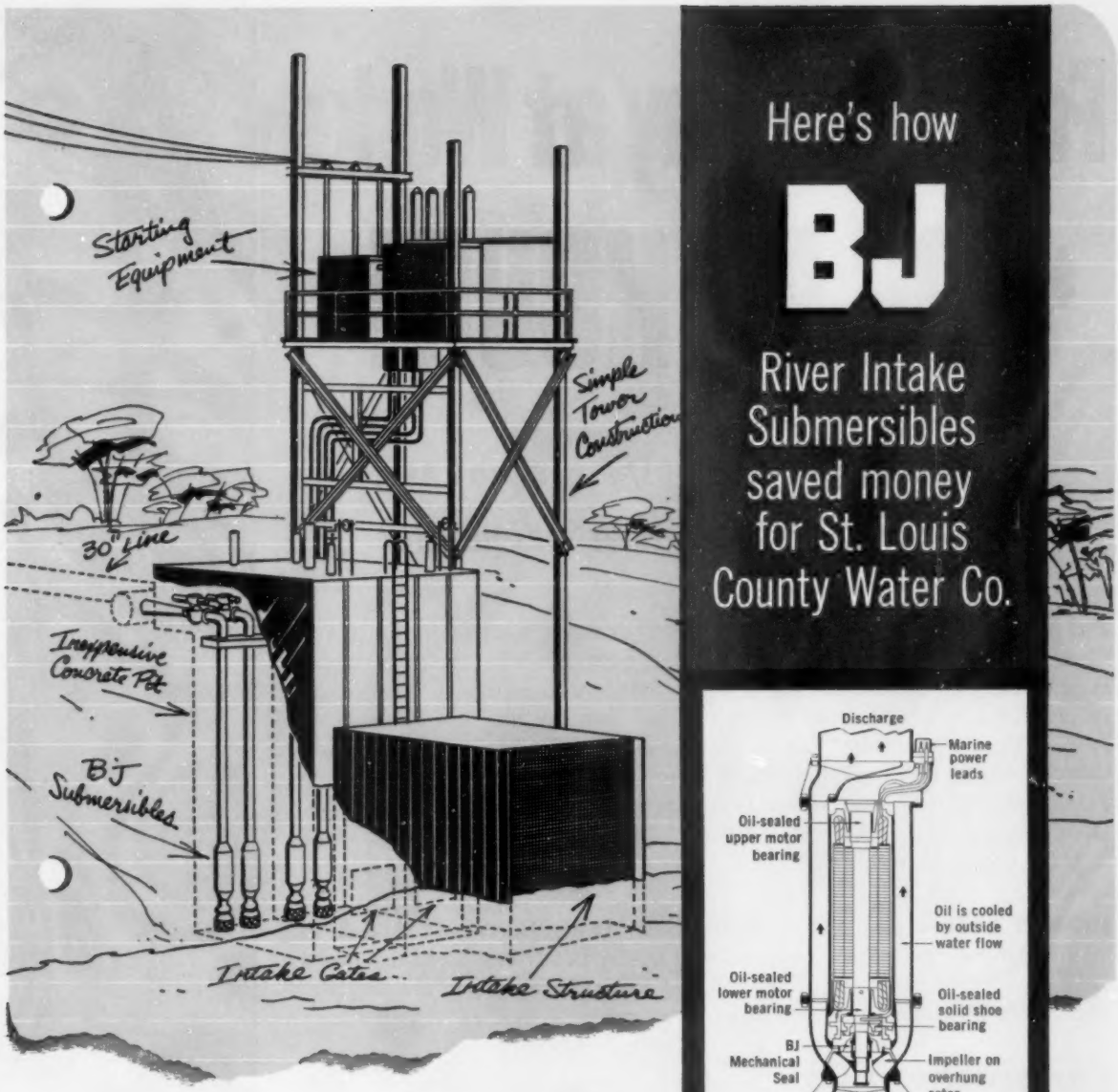
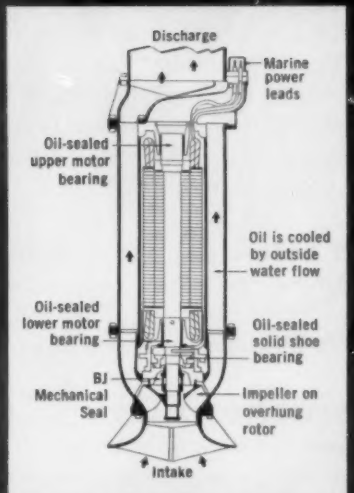
Minneapolis 14, Minnesota



Here's how BJ River Intake Submersibles saved money for St. Louis County Water Co.



St. Louis County Water Company saved money on their South County Plant installation by using Byron Jackson river intake submersibles. Four completely submerged BJ motor-pump units eliminated the need for an expensive elevated structure to house motors above flood stage. Intake and pump structure are simple concrete pit construction. The only elevated structure is a low cost platform which holds starting equipment.

These BJ Submersibles are unaffected by flood or weather conditions... are always primed and safe from vandalism. The mechanically sealed, oil-filled motor is close-coupled above the pump with all bearings inside the motor housing. No bearings are in the pump itself. Thus no bearings are exposed to silty water. Each pump delivers 3500 GPM against a 100 foot head, and is powered by a 100 HP, 1750 RPM motor. One man, at a remote panel located in the main plant a mile and a half from the river, controls the entire operation.

No bearings in the pump!

All bearings are in the sealed, oil-filled motor.

BYRON JACKSON PUMPS

INCORPORATED

A subsidiary of Borg-Warner Corporation
P.O. Box 70 • Lawrenceburg, Indiana

BJ SINCE 1872

Write for complete "Submersible Facts" file including primary, booster and river intake uses.

Ford Economy at Work:

$4.96 AN HOUR!

Cost includes all fuel, maintenance, depreciation, $2.20 an hour for operator

FORD TRACTOR ECONOMY draws a strong citation from Elmer L. Nordness, Water Superintendent of Madison, Wis. The above operating figures for a Ford Tractor with digger and loader are based on department records of actual operation—do not include standby time nor hours spent moving from job to job. "This is our fourth Ford Tractor," Nordness says. "They're half the cost of other rigs, so we can afford to trade them, after 2 or 3 years of punishment by all kinds of operators. And never forget, there's a lot of waiting time in our work. We can afford it with Ford where we can't with the expensive rigs."

FORD MOBILITY is equally important to Mr. Nordness. "Madison is a long, narrow city heavily congested with traffic. Both of my Ford rigs move right along in traffic. Once on the job, the Fords don't take up much space. Traffic can flow around them without interruption."

FORD VERSATILITY is still another big "plus" in service and maintenance of Madison's water lines. The units dig, backfill, clean up, and load excess dirt into trucks. "Some of our work—simple digging—we let out on contract," says Mr. Nordness."But we give Ford the *hard* jobs, the ones requiring ingenuity on the part of the operator and versatility on the part of the machine."

FORD TRACTORS can save *you* time, manpower and money, too. Discuss their many uses with your nearby dealer soon, or write to: Tractor and Implement Division, Ford Motor Company, Birmingham, Michigan.

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because they save more money!

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PR System of Coordinated Traffic Control

733. Literature is available on all-electronic equipment for coordinated traffic signal operation from Automatic Signal Div., Eastern Industries, Inc., Norwalk, Conn. System is usable for both arterial and grid network signal systems. Check the reply card.

Automatic Trash Pick-Up Unit

734. Features of the Litter Bug include 2½ hp engine, electric starter, coarse-weave bag and low center of gravity. Check the reply card or write Mid East Sales Co., P. O. Box 62, Lockland, Ohio.

Catalog on Stationary Diesels

735. The Model 65 Superior stationary diesel is described in Bulletin 111 available from White Diesel Engine Div., The White Motor Co., Springfield, Ohio. Typical applications for these 6 or 8 cylinder engines are municipal power plants and water works and sewage disposal plants. Check the reply card.

Valuable Catalog on Chemical Feeders

732. A comprehensive catalog on chemical feeders that provides users of liquid metering pumps with specifications so complete and accurate that they can quickly select the exact unit required to do any specific job is available from Manzel, 315 Babcock St., Buffalo 10, N. Y. Check the reply card for complete description of every class of pump, with details on construction.

Type AF Rotary Positive Blowers

736. Bulletin AF-154 contains descriptive information and operating data regarding rotary positive blowers that are rated from 1 to 7 psig and will handle from 10 to 700 gpm of air. Write Roots-Connersville Blower, 900 West Mount St., Connersville, Ind., or check the reply card for selection and dimension tables and application information and illustrations.

Self-Priming Light and Heavy-Duty Centrifugal Pumps

737. Contractors pumps are fully described in a catalog available from Leyman Mfg. Corp., McGowan Pump Div., 58 Central Ave., Cincinnati 2, Ohio. Sections covered are capacity charts, parts lists, schematic drawings and pump specifications. Check the reply card.

Seeders and Soil Working Tools

738. Sherman-Gill 6-in-1 soil working tool is described in bulletin from Gill Mfg. Co., Charlotte, N. C. Scarifying, leveling, grading, backfilling, pulverizing and rolling are the jobs the unit can do. Seeders are also included. Check the reply card.

Golden Anderson Cushioned Valves in Action

739. Schematically shown are various piping and valve arrangements for particular applications such as accurate water level control in reservoirs and isolating part or all of a water system. Check the reply card or write to Golden-Anderson Valve Specialty Co., 1244 Ridge Ave., Pittsburgh 33, Pa., for Bulletin G-5.

Rotary Air Compressor For Construction and Maintenance

740. An 8-page, 2-color Bulletin, P-106B, describing the Le Roi 600 compressor is available from the Le Roi Div., Westinghouse Air Brake Co., Milwaukee, Wis. General specifications are listed and 38 photos are used to illustrate the unit. Check the reply card.

MORE LISTINGS ON PAGES 37 TO 54

Distributor For Applying Every Type of Bituminous Material

741. Complete details about the Littleford Model D spray leader are available in Bulletin HH-30 from Littleford Bros., Inc., 453 E. Pearl St., Dept. HH-30, Cincinnati 2, O. Check the reply card for your copy.

Compactor For All Asphalt Patching and Repairing Jobs

742. A self-propelled, one operator compactor that is used for tamping and rolling asphalt close to walls, light poles, traffic signals and in all inaccessible places is described in literature from Lucas Asphalt Compactor Co., 2209 E. Market St., Stockton, Calif. Check the reply card today.

Electronic Speedmeter For Traffic Control and Surveys

743. The Speedmeter is a speed measuring instrument used to determine the exact speed of a moving vehicle by means of road tubes. Check the reply card or write Streeter-Amet Co., Grayslake, Ill., for the latest information.

Combination Pipe-Leak Locator

744. Information on an electronic multi-purpose instrument that solves both pipe location and water leak detection problems is available from The Goldak Co., 1544 W. Glenoaks Blvd., Glendale 1, Calif. Check the reply card today.

New Sign Catalog Available

745. Contents of this catalog include all popular U. S. Standard wordings and symbols and a complete inventory of both plain and reflectorized standard signs. Check the reply card or write for Catalog G-57, Grimm Stamp and Badge Co., 8104 Rosalie Ave., St. Louis 17, Mo.

Ball Joint Pipe For River Crossings

746. A well illustrated 32-page catalog containing instructions for assembly, weights and dimensions, and different methods of installing Molox ball joint pipe for river crossings and submarine service is available from American Cast Iron Pipe Co., P. O. Box 2603, Birmingham 2, Alabama. Check the reply card.

Monolithic Floor Surfacing Material

747. Monile, a dense man-made stone, is formed in place and bond to cement or other surfaces and is chemical-resistant and is resistant to freeze-thaw and sharp impact. Complete information from The Master Mechanics Co., 2097 Columbus Rd., Cleveland, Ohio.

Locate Water Leaks Quicker and Easier

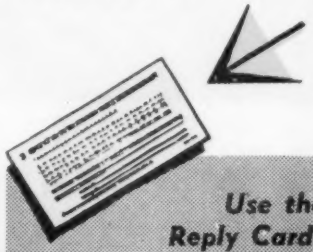
748. An aquaphone that requires no mechanical connection between probe and diaphragm to break or cause of trouble is described fully in literature from Aqua Survey & Instrument Co., 2012 Leslie Ave., Cincinnati 12, Ohio.

Tractor Shovels For Heavy-Duty Bulk Materials Handling

749. A 6-page highly illustrated bulletin on the all-purpose 1¼ cu. yd. Trojan tractor shovel is described in detail from The Yale & Towne Mfg. Co., Contractors Machinery Div., Batavia, N. Y. Check the reply card for complete specifications and a list of standard and optional equipment.

Cut and Fill Calculations By Electronic Computers

750. Design earthwork calculations are performed by high-speed electronic computers in a matter of minutes. It can also handle drainage and bridge problems and traffic surveys. For step by step operation of this computer check the reply card or write to ElectroData, Div. of Burroughs Corp., 535 E. Walnut St., Pasadena, Calif.



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Roanoke, Va., Nov. 6-8

Nebraska Section, SIWA
Hastings, Nebr., Nov. 7-8

Florida Section, AWWA
Miami Beach, Fla., Nov. 10-13

North Carolina Section, AWWA
Raleigh, N. C., Nov. 11-13

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Florida Section, SIWA
Jacksonville, Fla., Nov. 11-13

American Public Health Ass'n.
Cleveland, Ohio, Nov. 11-15

South Carolina Section, SIWA
Columbia, S. C., Nov. 15

American Ass'n. of State Highway Officials—43rd Annual Convention
Chicago, Ill., Nov. 18-22

Oklahoma Section, SIWA
Water & Sewage Short Course
Stillwater, Okla., Nov. 18-22

Exposition of Chemical Industries
New York, N. Y., Dec. 2-6

American Road Builders' Ass'n. Annual Convention
Washington, D. C., Jan. 20-23, 1958

New York Section, SIWA
Annual Meeting
New York City, Jan. 23-24, 1958

Associated Equipment Distributors
39th Annual Meeting
Chicago, Ill., Jan. 26-30, 1958

National Bituminous Concrete Ass'n. Annual Meeting
Las Vegas, Nevada, Feb. 4-6, 1958

Associated General Contractors Annual Meeting
Dallas, Texas, Feb. 10, 1958

National Crushed Stone Ass'n. Annual Convention
Chicago, Ill., Feb. 17-19, 1958

New Jersey Section, SIWA
Atlantic City, N. J., Mar. 12-14, 1958

National AWWA
Dallas, Tex., Apr. 20-25, 1958

Southwest Section, AWWA
Dallas, Tex., Apr. 20-25, 1958

6th Inter-American Congress of Sanitary Engineering
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NEW LISTINGS (Cont.)

Electronic Computer For Highway Planning

751. A data processing system that computes cut and fill, aerial triangulation and highway alinement data that can be plotted into final, meaningful cross-sections, profiles and illustrated cut and fill quantities is described in literature from Benson-Lehner Corp., 11930 Olympic Blvd., West Los Angeles 64, Calif. Check the reply card.

Making Waste Pay The Conversion Way

752. A new income-producing technique for utilization of garbage and other nuisance wastes provides a practical solution for cities of all sizes through bacterial conversion of wastes into a salable, sanitary, odorless, nutrient-reinforced humus. Details on the Earp-Thomas Continuous-Flow Digester and bacterial cultures are available from the Earp Laboratories, Dept. P, High Bridge, N. J. Check the reply card.

1958 Chevrolet Trucks Covered in Valuable Catalog

753. High-capacity panels, pick-ups, four-wheel drive models, dump and stake models are covered. Check the reply card or write Chevrolet Division of General Motors, Detroit 2, Mich., for information on these 6 cylinder and high-compression V8 trucks.

System For Duplicating and Filing Engineering Drawings

754. The Recordak system for comprehensive filing of engineering drawings is described in literature available from Recordak Corp., 415 Madison Ave., New York 17, N.Y. Drawings are first microfilmed and then they are added to an aperture card for indexing. Check the reply card for full details.

Permanent Road Patching Anytime of the Year

755. Keegan Utility Patcher consists of a chassis, an air compressor for cutting pavement, a self feed loader which carries oil, dry material to make hot patch and binder and unit is capable of making 30 tons of hot mix per hour. Check the reply card or write Keegan Utility Patcher, 3830 Monroe Ave., Pittsford, N. Y., for full information.

Many Courses Available From Correspondence School

756. All the varied branches of civil engineering are subjects of courses offered by the International Correspondence Schools, Scranton, Pa. The many courses are outlined completely in literature available. Check the reply card today.

•

WATER WORKS

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

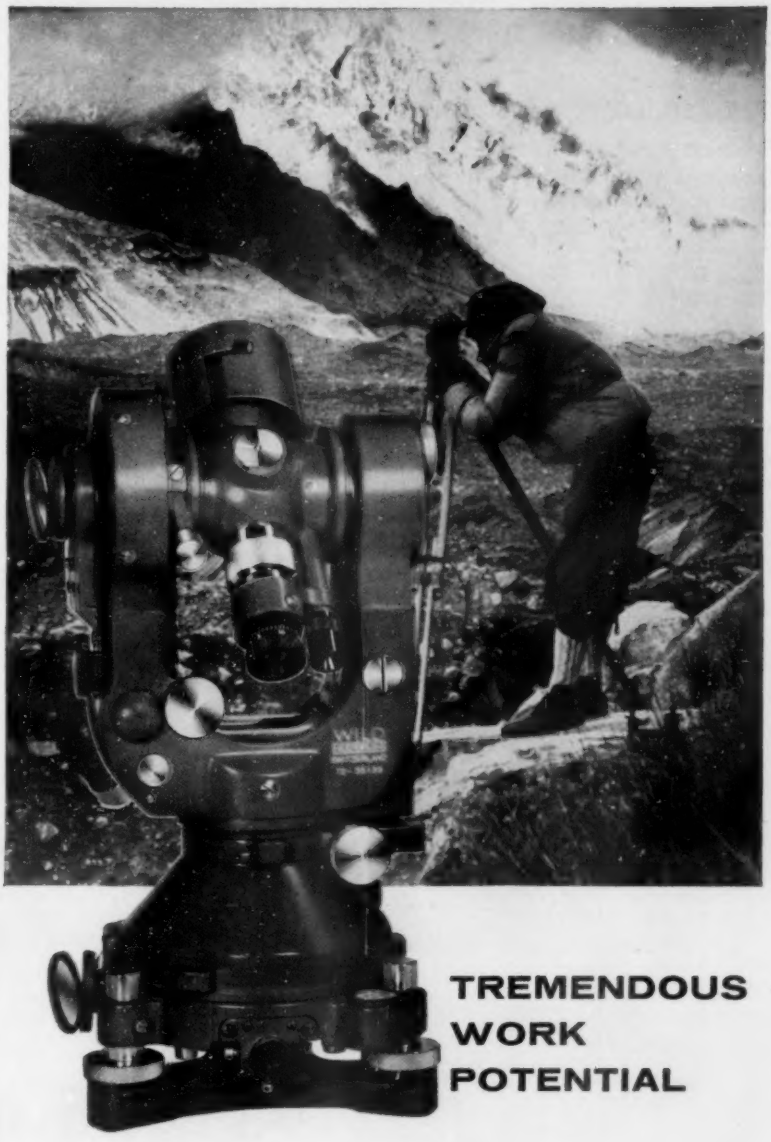
76. An 80-page manual, issued by R. D. Wood Co. Independence Sq., Philadelphia 5, Pa., presents specifications for "Sand-Spun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews fire hydrant and R. D. Wood gate valves.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

Makes Underground Pipe Installation Easy

115. One-man operated hydraulic pipe pusher, pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts ask for Form E-213, Greenlee Tool Co., Rockford, Ill.



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To order these helpful booklets check the reply card opposite page 36.

Ball and Socket River Crossing Cast Iron Pipe

33. Literature is available describing Clow ball and socket cast iron pipe for river crossing, or any installation where full 15 degree free turning deflection is desirable. For full description and specifications, address James B. Clow & Sons, Inc., P. O. Box 6600-A, Chicago 80, Ill., or check the reply card.

Engineering Information and Water Distribution Products

49. Helpful engineering information, covering water distribution problems, is available from Mueller Company in their W-96 Water Works Catalog. The 328 page catalog features a quick reference sectional indexing arrangement for easy location and identification of the hundreds of water distribution and service products illustrated. Check the reply card and you will receive detailed information on a complete line of water works equipment.

Use The Reply Card

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American Water meters described in Bulletin No. 56 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Check the reply card.

Engineering Data on Tilting Disc Check Valves

196. The Chapman tilting disc check valve is designed to lift away from the body seat without sliding or wearing; closes without slamming. Operating principles, details of construction, dimensions, recommendations and engineering data are fully covered in 18-page Bulletin No. 30. Get your copy by checking the reply card or write to Chapman Valve Mfg. Co., Indian Orchard, Mass

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal control of certain tastes and odors plus other aids in high quality water production. Check reply card for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

100 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH control and description of comparators, colorimeters and similar devices. A 100-page booklet is available by checking reply card. W. A. Taylor Co., 7304 York Road, Baltimore 4, Md.

Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 5415, Shepard Station, Columbus 19, Ohio. Water quality, construction methods, costs, performance and other topics are considered. Check the reply card to get your copy.

Information on Service, Valve, Roadway and Meter Boxes

122. Literature on specifications covering "Buffalo" service, valve, roadway and meter boxes, and adjustable valve boxes for water and gas has just been released from Buffalo Pipe & Foundry Corp, Box 55-Station B, Buffalo 7, N. Y. Check the reply card for your information on these valve boxes.

Complete Information on Portable Electric Plants

202. New power-packed electric plants that are smaller and easier to move around are fully described in bulletin A-406 available from D. W. Onan & Sons Inc., 3682 University Ave., S. E. Minneapolis 14, Minn. Applications, specifications and optional equipment are covered. Check the reply card.

Engineering Data on Diatomite Filters

139. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the reply card for full information including table of filter sizes and capacities, space required and filter operation.

What You Should Know About Steel Reservoirs and Standpipes

163. In a handsome 24-page booklet "Horton Steel Reservoirs and Standpipes," the Chicago Bridge & Iron Co., Chicago 4, Ill., shows installation from 50,000-gal. to 10,000,000-gal. capacity with several types of roof and special architectural features. Engineering data includes information on capacities, foundations and improved surface protection. Check the reply card to get your copy.

Now Every Municipality Can Own a Trencher

173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 7 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the reply card.

Lay Water Mains Faster With 'Fluid-Tite" Couplings

184. Get permanent water-tight joints automatically with Century "Fluid-Tite" couplings for Century asbestos-cement pressure pipe. Full details on this faster installation and self-energizing couplings are available from Keasbey & Mattison Co., Ambler, Penna. or by checking the reply card.

Design of Prestressed Concrete Tanks

194. An 8-page technical Bulletin, T-19, on the Design of Prestressed Concrete Tanks, gives engineering data and formulas of general interest to anyone considering prestressed concrete for storage tanks. Check the reply card or write The Preload Co., Inc., 21 East 37th St., New York 16, N. Y.

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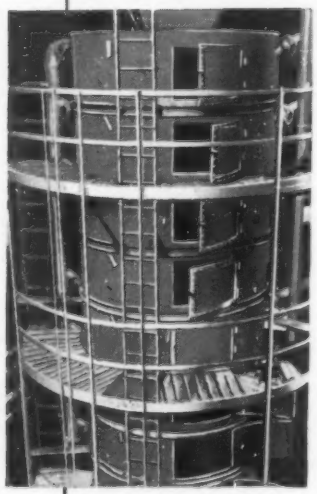

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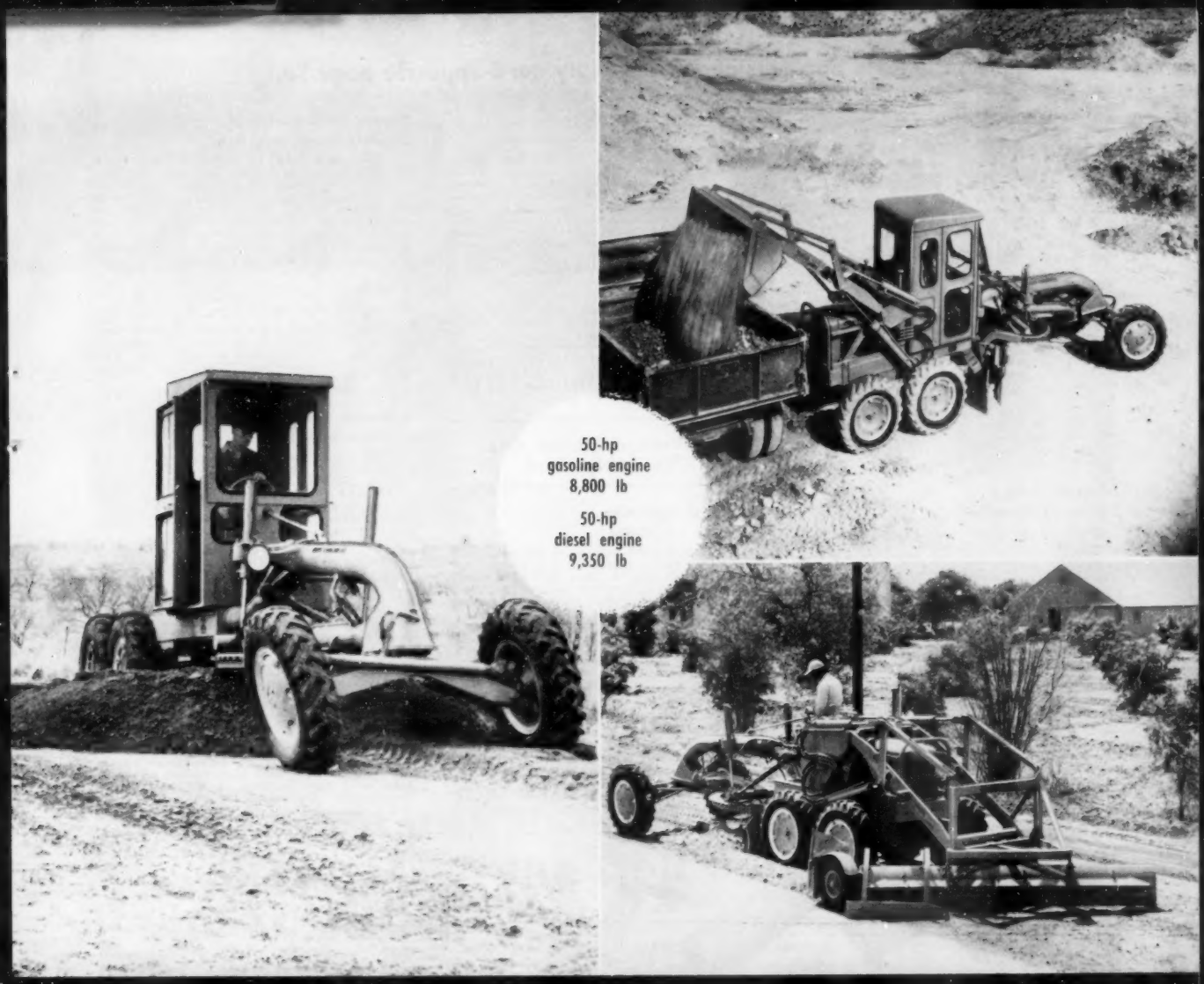

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ROLL-AWAY is an Allis-Chalmers trademark.

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Handbook of Cast Iron Pipes and Fittings

52. Full engineering data on products of the Alabama Pipe Co., including Super De-Lavaud cast iron pressure pipe and pipe fittings, valve boxes and other municipal castings are provided in Pressure Pipe Catalog No. 54, a 196-page publication of Alabama Pipe Co., Anniston, Ala. Weights, dimensions and specifications are clearly indicated in this easy to use reference. Requests for this valuable publication should be accompanied by your business letterhead.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Manual on Pipe Finding Techniques

213. A manual on special pipe finding and leak detecting techniques of interest to utilities, municipalities, oil and gas companies is announced by Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif. The manual contains a number of articles on locating buried pipes and cables and detecting and locating fluid leaks in pipe lines. Check the reply card for your free copy.

Does Your Water Works Have Standby Power?

224. Climax Engines are used in Municipal Water Works to supply dependable power during emergencies. They are available in a range of sizes from 40 to 605 Max. HP and operate on either natural gas, butane, gasoline or a combination of these fuels. Use the handy reply card to obtain complete details and literature from Climax Engine Mfg. Co., 208 S. La Salle St., Chicago 4, Illinois.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the reply card today.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. The larger model is available with air power unit to eliminate manual pushing. Get full details by checking the reply card. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

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Review of Diatomite Filtration of Water

285. A detailed review of the application of diatomite in the general field of water filtration, including uses in municipal supply and swimming pools is contained in a well-prepared 16-page bulletin. Specific applications to certain water treatment problems are also discussed. Write to the Dicalite Division, 612 So. Flower St., Los Angeles 17, Calif. for Bulletin F-552 entitled, "Diatomite Filtration of Potable Water," or check the reply card.

Quick Review of Water Meters

316. A helpful condensed catalog which covers sizes and types of water meters for every kind of service is available from Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa. Each type is illustrated and fully described; specifications and prices are included. Get Bulletin W-800 by checking the reply card.

Factors to Consider in Elevated Tank Selection

299. Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check reply card for your copy.

Electric Generator Plants

325. Mobile electric generating plants that provide an output of 2300 watts, 115 volts AC are described in literature available from Pioneer Gen-E-Motor Corp., 5841 West Dickens Ave., Chicago 39, Ill. Weigh 200 lbs. and can be mounted on rubber tires or steel skids.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa.

Valuable Booklet on Porous Diffuser Plates and Tubes

341. A helpful 16-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in rapid sand filters and activated sludge plants. Full data are provided for the consulting engineer. Maintenance of porous media is also discussed at some length. Get Form 1246 from Norton Co., Worcester 6, Mass. by checking the reply card.

All About Centrifugal Pumps

361. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use reply card or write to Fairbanks, Morse & Co., Dept. P.W., Chicago 5, Ill.

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STEEL PIPE

Manufactured in new, modern continuous mills to specifications per ASTM-A139 Grade B; which also conforms to API 5L standards. Automatic electric butt weld process, using submerged arc. Pressure tested. Ideal for use as line pipe for gas and oil, for municipal water systems and irrigation, high velocity tubing for air conditioning and heating, heat exchangers, well casing, grain and mineral spouting, as well as many other manufacturing and industrial uses.

Available in 6", 6⅝", 8", 8⅝", 10", 10¾" diameters, from 16 gauge up to and including .188 wall thickness; 20, 30 or 40-foot lengths; and in plain or belled ends. Quotations available for Victaulic or Dresser end processing, and coating.

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This shows a portion of one of the year's outstanding conveyor jobs . . . Consumer's Company, Crystal Lake, Illinois.

It's not true that Barber-Greene invented the belt conveyor

. . . but it is true that Barber-Greene introduced the greatest advance in belt conveyors since their invention —*standardization.*

Before Barber-Greene entered the field in 1916, belt conveyors were economical on paper—costly to build. Most installations were tailor-made, involving slow single-unit production . . . expensive field engineering . . . complicated assembly.

Then Barber-Greene developed a unique system of standardized conveyor components that quickly outdated ordinary methods of erection, operation and maintenance. Soon standardized conveyors were known for:

Faster delivery. Packaged units come from dealer stock or are immediately available from the factory.

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Unmatched flexibility. Interchangeable parts simplify lengthening or shortening of conveyors to meet changing needs.

Today, standardized components are practical for installations of nearly every length, width and capacity. Wherever used, they give a new meaning to conveyor economy, utility and flexibility.

Drives, take-ups and similar units are completely assembled, aligned and adjusted by experts at the factory to assure trouble-free operation.

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Engineering Data on Equipment for Municipal Water Conditioning

347. For information on the design and operation of many types of water treatment plant equipment, including the Graver Reactivator, pressure filters, iron removal installations, zeolite softening and water conditioning for swimming pools get Bulletin WC-113 from Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y. Check the reply card.

Testing Water Meters

353. This 40-page catalog is a discussion of fundamentals and a guide to sound practice in meter maintenance. It covers standard specifications of meter accuracy, descriptions of the latest developments in meter testing equipment and many drawings and diagrams. For your copy write The Ford Meter Box Co., Inc., Wabash, Indiana, or check the reply card.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Red Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Check the reply card.

What You Should Know About Hypochlorination

395. "Hypochlorination of Water" is the name of an informative publication issued by Olin Mathieson Chemical Corp., Industrial Chemicals Div., Baltimore 3, Md. In it there is a discussion of chlorination theory, practice and equipment; control of algae, tastes and odors; and laboratory testing.

What You Should Know About Venturi Tubes and Nozzles

400. A comprehesive bulletin, No. 100, of interest to all engineers dealing with the measurement of liquid flow and its various ramifications has been issued by Simplex Valve & Meter Company, Lancaster, Pa. Data on advantages, construction and installation details, range of sizes and specifications are given in simplified form.

Welded Steel Pipe from 6 to 10 3/4" Diameter

382. High grade butt welded light-weight steel pipe from 8 to 16-gauge in 20, 30 and 40-foot lengths, plain or asphalt coated, with choice of joints. Also available up to 0.188 wall. Check uses for municipal water lines, irrigation, well casings and many other applications. Self explanatory literature from Valley Mfg. Co., Valley, Nebraska.

Helpful Engineering Data on Cast Iron Pipe

422. Complete data on McWane Super-DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long.

Foxboro Teletax Telemeter System

430. The Foxboro Teletax is a long-distance transmitter-receiver system which provides a continuous record on a permanent chart and is of the impulse-duration type. Any method of transmission may be used. Check the reply card or write The Foxboro Co., Foxboro, Mass. for full information.

Important Factors in Water Meter Selection

463. Interchangeability of parts is an important advantage that is yours when you use Trident meters. The newest parts fit your oldest Tridents so you modernize when you repair. Get full data on the entire Trident water meter line by checking the reply card or write to Neptune Meter Co., 19 West 50th St., New York 20, N. Y.

Residual Chlorine Recorders For Water Plants and Swimming Pools

508. An instrument for measuring residual chlorine amperometrically in a continuous sample and recording the reading in parts per million on a 24 hour circular chart is described fully in literature available from Wallace & Tiernan Inc., Box 178, Newark, N. J. Check the reply card today.

Manual on Valves, Fire Hydrants and Accessories

559. A 244-page manual covering Darling valves and fire hydrants in a broad range of types, sizes and constructions is available from Darling Valve & Mfg. Co., Williamsport, Pa. Engineering data, application tips, valve accessories information, reference data on materials, specifications and standards are covered.

Diatomite Filters in Water Filtration

596. A new line of IWF diatomite filters is featured in this 10-page Bulletin 651 by the R. P. Adams Co., Inc., 328 East Park Drive, Buffalo 17, N. Y. The IWF is ideal for medium and small town water supplies and the bulletin provides installation drawings, sectional views and operational sketches.

Use The Reply Card

Water Tanks, Reservoirs and Standpipes

631. Data on steel water tanks, reservoirs and standpipes of all capacities are included in literature available from Graver Tank & Mfg. Co., Inc., East Chicago, Ind. These units are fabricated and erected by the company. Check the reply card.

Simplify and Save on Public Works Electrical Construction

710. Information and literature is available from Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa., on how you can simplify electrical details of a public works project. Westinghouse field specialists will help you plan the electrical system to fit your need. Check the reply card.

Manual on Durajoint Waterstops

716. Results of tests run on Durajoint waterstops and the many advantages offered by these waterstops are included in Manual No. 457 available from Durajoint Technical Information Center, Dept. 24, 121 Hill Ave., Aurora, Ill. Check the reply card.

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INNER CIRCLES PROVIDE

Unique Sewer Recovery...

The crown of an obsolete and failing brick sewer in Toledo, Ohio was removed to permit relining by the Inner Circles Method with no interruption to surface traffic.

Threads Through Obsolete Brick "Egg" Sewers

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SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass. Check the reply card.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included.

Engineering Data on Screening Equipment

77. Water, sewage and industrial waste screening equipment is fully described in a 28-page book, No. 2587, offered by Link-Belt Co., Dept. 137, Colmar, Pa. Complete data for the engineer and tables to determine the proper size unit for handling various capacities are included. This valuable, comprehensive booklet may be obtained by checking the reply card.

Helpful Design Data For Sewage Ejectors

81. The application and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking the reply card.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

Submersible Pumps For Municipal Use

185. A new 12-page bulletin that describes the line of BJ submersible pumps is available from Byron Jackson Pump Inc., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif. Construction and operation of the pumps are covered along with a handy selection chart that gives capacity and head performance.

Information on Boring Machines

365. General operating instructions for the Earthworm boring machine, a portable compact unit for underground installation of pipe and conduit are available in new bulletin just released by Lube Jack Co., P. O. Box 1100, Santa Monica, Calif. Suggested procedures for installing pipe or conduit and a price list are included. Check the reply card.

Joint Materials and Sealers Described in Latest Literature

492. Fibre material, asphalt board, cold pour joint sealer, crack fillers and concrete curing compound are described fully in literature available from Prestite-Keystone Engr. Products Co., 3906 Chouteau Ave., St. Louis 10, Mo. Check the reply card for information on these paving and building products.

Complete Story of Rubber as a Coupling Medium in Pipelines

295. "Joint Enterprise", a booklet describing Tylox rubber joints for coupling pipe used in sewerage, drainage and waterworks projects is now available from Hamilton Kent Manufacturing Co., 7 West Grant St., Kent, Ohio. The booklet also contains illustrated case histories of Tylox-Jointed installations, and suggestions to assist engineer in specifying Tylox joints for both tongue and groove, and bell and spigot pipe. Check the reply card.

Solids Pump Uses Recessed Impeller

428. The Wemco "Torque-Flow" solids pump works with a completely recessed impeller which creates a vortex effect and transmits power exactly as in a fluid type torque converter. This avoids flow through impeller vanes and reduces clogging difficulties when handling sewage sludge or abrasive materials. For full details get Bulletin P10-B6 by writing to Western Machinery Co., 650 Fifth St., San Francisco 7, Calif., or check the reply card.

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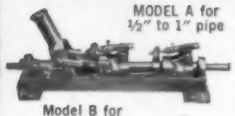
Complete Treatment Unit for Handling Flows to 0.5 MGD

503. Developed for sewage flow characteristics of small communities, the Aerator-Clarifier is a complete treatment unit utilizing automatic balance of activated sludge solids with sewage flow. Bulletin 129, issued by the Chicago Pump Co., 422 Diversey Parkway, Chicago 14, Ill., describes application of this unit. Check the reply card.

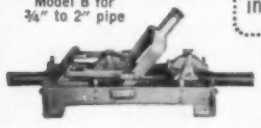
Butterfly Valves For Water and Sewage Treatment Plants

507. Rubber seated butterfly valves are described and illustrated in a new two-color Bulletin No. 5603, available from F. B. Leopold Co., Inc., 227 So. Division St., Zelienople, Pa. Complete details on the performance and construction features of the valve are included.

Only the
Trojan Pipe Puller & Pusher
gives you continuous action . . .
No Resetting of Grip!



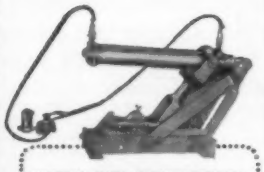
CUTS COSTS! SAVES TIME-
in installing or renewing pipe under pavement



The Trojan combines pushing and pulling operations in one machine—eliminates all time-killing resetting of grip—keeps pipe continuously moving. Does the job at lower cost—in far less time.

Model A weighs 65 lbs.—requires only 5' trench. One man can easily install the average service. 15 tons of pushing pressure possible.

Model B (either hand or air powered) needs only 5½' trench—has 3 speeds for different soils—is reversible in 30 seconds. Push pipe comes in 30" lengths, assures straight travel.



NEW AIR POWERED Model B
Does all the work for you. Handles ¾" to 2" pipe.

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TECHNICAL ADVANTAGES

- 1—Requires an average of 40% less wash water
- 2—Completely eliminates mud balls
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- 4—Produces "new" filter media after short period of normal operation
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- 6—Low installation cost
- 7—Low operating cost
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- 9—Less "time out" washing filters

PALMER

ANTHRAFILT FILTER MEDIA

FAR SUPERIOR to Sand or Quartz Media, as it Double length of Filter runs, nearly halves wash water needs; with less coating, caking, or balling.

Filters are in service more as wash water cycle shorter. Better removal of bacteria, taste, odor. Increased Filter output, better effluent. Ideal for industrial acid and Alkaline solutions. Ask any user.

PALMER FILTER EQUIPMENT CO.
822 E. 8th St. • Erie, Pa.

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"We needed 40,000 ft. of trench dug as deep as 11 ft. in all kinds of weather without delay," said A. R. Palombo.
Here's why the OTTAWA BACKHOE was chosen for the Mount Joy, Pennsylvania sewer job
The A. R. Palombo Construction Company of Pittsburgh, Pennsylvania, chose the Ottawa Backhoe for their Mount Joy, Pennsylvania job, to dig 40,000 ft. of trench for 6" and 8" lateral sewer lines, many of which were 11 ft. deep.
The Ottawa patented ejector bucket, which positively ejects wet, sticky material, made it possible for them to work through all kinds of weather to complete the job. There was no costly delay due to shaking, slamming or hand cleaning, as required with buckets which do not have the automatic ejector feature.
Mr. A. R. Palombo stated, "We are also using two Ottawa Backhoes on our Bethel Boro sewage job, for several reasons. It has a powerful hydraulic action, and the two-lever control makes it easy for the operator to work in close quarters." Tight areas, trees, low wires and heavy traffic which interfere with production when using large cable type diggers are no problem with the Ottawa Backhoe.
For more information on how you can save money by using the Ottawa Backhoe with patented dual One-Trols and automatic ejector bucket, write to
OTTAWA STEEL DIVISION
L. A. Young Spring and Wire Corporation
OTTAWA, KANSAS
ANOTHER LAYCO PRODUCT
Ottawa

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Plastic Pipe For Liquids and Gases

514. Kraloy rigid polyvinyl chloride plastic pipe can be used for liquids and gases and will not rust, rot or corrode. Write to Kraloy Plastic Pipe Co., 4720 E. Washington Blvd., Los Angeles, Calif., or check the reply card for complete details on this lightweight pipe.

Construction Pump Bulletin Contains Selector Chart

517. A ready-reference chart enabling builders, contractors and maintenance men to select the type of pump best suited to specific construction jobs is one of the features of the bulletin available from Barnes Mfg. Co., Mansfield, Ohio. Check the reply card for information on the right pump for dewatering, sprinkling, equipment cleaning, sewer lines and tunneling.

Bulletin On Locating Trouble in Pumps

533. A bulletin to help locate and correct common ailments of rotary, centrifugal and steam pumps has been released by Worthington Corp., Merchandising Sales Dept., Harrison, N. J. Pictures give a full description of pump troubles—from failure to deliver water to the loss of capacity after starting.

Weir and Flume Meters For Water, Sewage and Industrial Wastes

612. An illustrated 8-page catalog, published by Penn Instruments, Div. of Burgess Manning Co., 1004 Haverford Ave., Philadelphia 4, Pa., describes fully transmission meters, indicating and non-indicating transmitters. It also covers new and novel metering arrangements which have not heretofore been generally used in water and sewage plant installations. Check the reply card.

Information on Welded Wire Fabric

729. Reinforced concrete sewer and culvert pipe that are made with U.S.S. American welded wire fabric are described in literature from American Steel & Wire Div., United States Steel, Cleveland, Ohio. Check the reply card for specifications and engineering data.

Reinforced Concrete Pipe For Culverts and Sewers

672. Elliptical Lo-Hed and Hi-Hed pipes, round pipe and flat base pipe are described fully in literature from American-Marietta Co., Concrete Products Div., 101 East Ontario St., Chicago 11, Ill. Headwall details, discharge curves, hydraulic capacity tables and hydraulic properties are included. Check the reply card.

CONSTRUCTION EQUIPMENT AND MATERIALS

What's Your Digging Problem? Repair Work? Trenches? Footings?

35. At today's prices, hand digging means the job will be costly. You can dig through asphalt and macadam, work fast and efficiently even in cramped areas with the tractor mounted Sherman Power Digger. From one position you can reach to dig 14 feet behind tractor in 180° arc and dig to a depth of 12 feet. For full details check the reply card. Sherman Products, Inc., Royal Oak, Mich.

A 1-Bag Capacity Concrete Mixer

72. A catalog describing the Model 6-S Dandie concrete mixer is available from the Kwik-Mix Co., Port Washington, Wisc. Printed in attractive colors, it explains the many construction and operating features of the 1-bag mixer. Also included is information on other sizes. Check the handy reply card.

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, and is available from Reed Mfg. Co., Erie, Pa. Check the reply card.

Design Manual on Complete Structural Systems

100. Manual contains technical information relative to Stran-Steels line of joists, studs, channels, ribbed decking and metal curtain walls. It is well illustrated and contains several pages of loading tables. For this valuable Manual write Stran-Steel Corp., Detroit 29, Mich., or check the reply card today.

A Fully Rotary Compressor by Jaeger

209. Complete information is available from The Jaeger Machine Co., Columbus 16, Ohio on this 2-stage, oil-cooled rotary compressor. Features include 80% fewer moving parts, up to 30% less weight, vibrationless operation and 100° cooler air. For full details check the reply card.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa. The treatment for every water problem is presented in illustrated case histories in this useful publication.

International 6-Cylinder Carbureted Power Units

398. A graphically-illustrated 12-page catalog CR-511-G, on IHC 6 new 6-cylinder power units is available. Power and fuel consumption curves and cutaway views of component parts of the units are covered. Check the reply card or write Construction Equipment Div., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., for specifications.

Tractors and Equipment for Municipal Use

407. Specifications for the John Deere crawler and utility wheel tractors, together with equipment for loading, dozing, mowing, sweeping and many other operations is covered in a comprehensive illustrated catalog issued by John Deere, Dept. 66B, Moline, Ill. Get your copy by checking the reply card.

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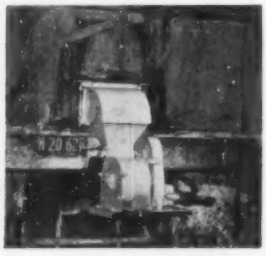
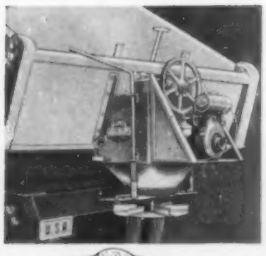
...with BAUGHMAN tailgate and pull-type ICE CONTROL SPREADERS

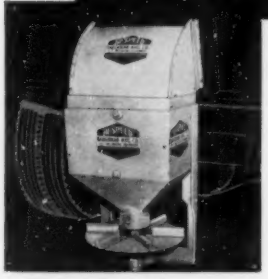


THE SALT MISER.
Hydraulic or auxiliary engine. Metering valve maintains accurate volume control. Controls permit left or right hand spread pattern.



MODEL MD-1.
Compact! Rugged! Operates on auxiliary engine. Spreads 8'-30'. Convenient controls for amount and direction of spread.

SUPER SPREADER.
Forward or reverse spreading. Mechanical or hydraulic drive. Any material up to ½" dia. Fits any dump body. Hard-metal criss cross tread provides even application.



MODEL HD-51.
Hydraulic operation. Hinged mounting for always-level position of unit. Controls for volume of material and spread pattern.

MODEL SC-52.
Pull-type. 360° spread pattern. Adjustable valve for quantity control.

PLUS truck-mounted equipment

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HERE'S ASSURANCE

that your concrete pipe will last longer!

Concrete pipe that is
REINFORCED WITH USS AMERICAN WELDED WIRE FABRIC
assures you of these important benefits:

- Permanence
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- No maintenance
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Reinforcement with USS AMERICAN WELDED WIRE FABRIC adds strength and permanence of steel to concrete pipe. It reduces the cost of installation and maintenance. It gives you a higher-quality job.

For the Best Reinforcement be sure it is USS AMERICAN WELDED WIRE FABRIC. This reinforcement is precision-manufactured from quality cold-drawn steel wires. Its quality is rigidly controlled to assure you a fabric that meets every specification—exactly—shipment after shipment.

USS AMERICAN WELDED WIRE FABRIC is made in a complete size range to suit any type of sewer or culvert, in circumferential wire sizes up to and including ½" at 2", 3", and 4" on centers. Write or call for more information.

IN MANY WAYS, IT PAYS . . . TO ASK,

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AMERICAN STEEL & WIRE DIVISION

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, New York

USS

UNITED STATES STEEL

To order these helpful booklets check the reply card opposite page 36.

How the "Payloader" Helps Public Officials

190. An attractive booklet "Getting More for the Tax Dollar with Payloaders" makes worthwhile reading for every public official in charge of construction and maintenance of roads, streets, and utilities. You will find illustrations and data showing dozens of ways the "Payloader" is used by cities, counties and states, plus convenient specifications on seven models. Check the reply card or write Frank G. Hough Co., 761 Seventh St., Libertyville, Ill.

Booklet Shows Design of Pre-Engineered Steel Buildings

271. Pre-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 16-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Use the reply card or write to Butler Mfg. Co., Kansas City, Mo.

Convenient Data on Tandem and 3-Wheel Rollers

449. This manual covers everything on the variable weight, 5-8, 8-10, 8-12 and 10-14 ton tandem rollers and on the standard and variable weight, 8, 10, 12, 14 ton and 8-10, 10-12, 12-14 ton 3-wheel rollers. Covered are the frame, transmission, final drive, front end and operator's controls. The designs, construction, performance and service of the rollers are fully outlined. There are plenty of illustrations along with a complete set of specifications for each roller model. Available from Huber-Warco Co., Marion, Ohio, or check the reply card.

Complete Bulletin On Municipal Supplies

473. Everything from leak locators to street signs is listed in the big 108-page bulletin "Municipal Supplies" published by Darley. Hundreds of different items for all city departments are included. Get your copy of Bulletin No. 155 from W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill., by checking the reply card.

Slide Rule PS1 Calculator For Concrete

713. A new pocket size slide rule calculator for the testing of concrete in compression is available from Forney's Inc., P.O. Box 310, New Castle, Pa. It is designed to convert instantly the pressure applied to concrete cylinders and blocks into psi.

Handbook on Selecting Power For Pumping

694. A 12-page power selection handbook, "Selecting Power For Pumping," has been released by the Advertising Div., Caterpillar Tractor Co., Peoria, Ill. This handbook is especially useful to those who have a pumping operation. It contains a checklist of features necessary for continued dependable operation on pumping jobs. List describes the proper requirements which an engine must have, backing them with illustrations and examples of efficient installations. Check the reply card today.

●

STREETS AND HIGHWAYS

Information on The Ottawa Heavy-Duty Backhoe

25. Features of this backhoe are an automatic ejector bucket; two levers do four operations; and a powerful hydraulic system with mechanical linkage to provide more digging power. For complete details check the reply card or write Ottawa Steel Div., L. A. Young Spring & Wire Corp., Ottawa, Kans.

Getting Specified Density In Granular Bases and Fills

188. Vibratory compactors offer the means for getting specified density in rock, slag, soil-bound macadam, gravel and sand base courses. Just one pass may suffice. Get complete information from Jackson Vibrators, Inc., Ludington, Mich. See how adaptable compactor units handle a variety of compaction needs. Check the reply card today.

Tractor-Shovels of Any Size and Bucket To Fit Your Need

21. Literature is available on 7 basic models of tractor-shovels that are gas or diesel powered, 44 to 165 hp., front, rear and all-wheel drive from Clark Equipment Co., Pipestone Rd., Benton Harbor 43, Mich. Check the reply card for information on 35 different buckets and attachments ranging from 6 cu. ft. to 5 cu. yds.

Gradall Pocket-Sized Reference Manual

114. This manual contains drawings portraying all Gradall dimensions and specifications and a well-rounded selection of photographs of the various Gradall models at work on actual jobs of all descriptions. Covered are the truck-mounted, crawler-mounted, self-propelled and railroad model Gradalls. Check the reply card or write the Gradall Div., The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio, for your copy today.

For Prompt Service Use The Reply Card

Help in Selecting Motor Graders

145. A 16-page catalog, No. 380, released by The Galion Iron Works & Mfg. Company, Galion, Ohio, describes the numerous construction and operation features of the Galion Model 503 Motor Grader. Optional equipment includes hydraulic shiftable mold-board, front-end scarifier, "V" and straight snow plows, rear-end bucket loader and bull-dozer. Check reply card for full data.

Complete Information on a Bituminous Paver-Finisher

200. A 12-page Bulletin describing the PF-90 bituminous paver-finisher is now available from Construction Equipment Div., Blaw-Knox Co., Mattoon, Ill. Various application possibilities and general specifications of the paver-finisher are covered.

Why a single investment in Blaw-Knox Universal Forms lets you take on a wider variety of curb and gutter work:

Completely interchangeable—In community street construction you can be faced with form changes that eat away big chunks of your profit. For instance, one job may require different spacing for division plates and your present forms won't work. Blaw-Knox Universal forms are completely interchangeable. Slots for division plates are spaced at one foot intervals, allowing you to tailor the same basic form system to many different jobs.

Save time and money—This basic standardization of form systems makes it easier to calculate the job, set and strip the forms, practically eliminates the necessity for handwork. There's no need for carpentry, no waste of single-use materials. The self-aligning feature eliminates guesswork and reduces the possibility of error.

Built sturdy for years of service—Many contractors have used Blaw-Knox Universal forms for ten, even twenty years. They're sturdy enough to take rough handling on job after job, light enough to be moved in a pick-up truck.

A form for every job—Blaw-Knox Universal Forms are available for every type of curb, curb and gutter, integral curb, or sidewalk job from straightaways to the most complicated layouts. See your Blaw-Knox Distributor—he can help you cut time and make more money with the right Blaw-Knox Universal Forms.

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Construction Equipment Division

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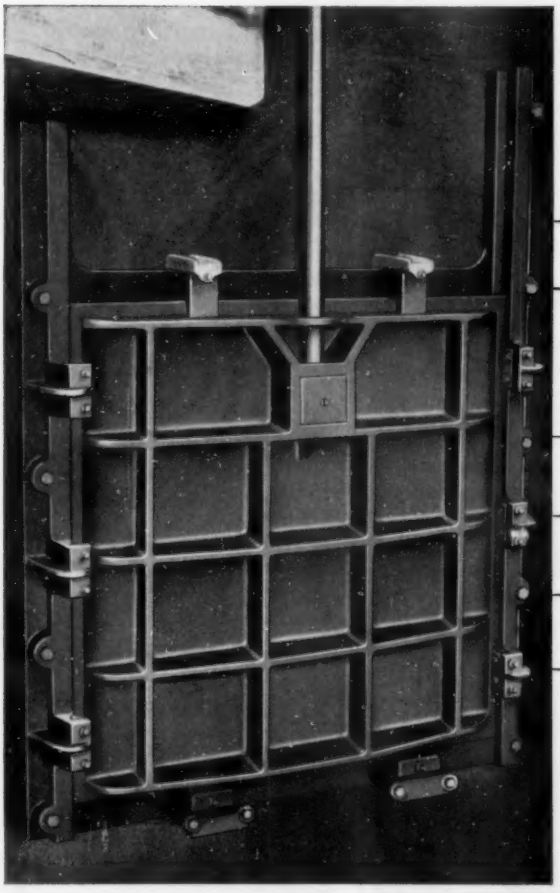
ARMCO GATE

to meet your needs

Expanded line of Armco Gates meets municipal sewage plant and water works requirements



This 48" x 48" Armco Gate (Model 55-15) is designed for maximum face pressure of 55 feet, back pressure of 15 feet. Many models feature top and bottom wedges as well as adjustable side wedges.

The recently expanded line of Armco Gates makes it easy to meet your water and sewage plant requirements. This wide variety of sizes and types of Armco Gates can save you time and money.

Look over the condensed table of size and pressure ranges. For more details, write us or call your nearby Armco Sales Engineer.

SIZE and PRESSURE TABLE

Type of Gate	Size Range		Maximum Face Pressure	Maximum Back Pressure
	Round Gates	Sq. and Rectangular Gates		
Heavy-duty slide gates	6" to 108" diameters	6" x 6" to 108" x 108"	30' to 100'	5' to 30'
Light-duty slide gates	8" to 72" diameters	6" x 18" to 84" x 78"	5' to 20'	0' to 10'
Flap Gates	4" to 120" diameters	24" x 24" to 96" x 60"	10' to 50'	—

Armco also supplies lifts designed for power or manual operation, and other accessories necessary for a complete gate installation.

Armco Drainage & Metal Products, Inc., 5737 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO GATES

To order these helpful booklets check the reply card opposite page 36.

Disposal of Brush and Tree Limbs a Problem? Here's your answer.

222. A new booklet, "The Modern Approach to the Brush Problem," shows how an Asplundh chipper reduces bulky branches and brush trimmings to chip size for mulch or easy removal. Write Asplundh Chipper Company, 505 York Road, Jenkintown, Pa., or use the handy reply card.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem reduce troublesome brush and trimmings to tiny, easy to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass.

Use of Patch Material On All Maintenance Jobs

297. With the Barber-Greene Mixall you can get hot patch material wherever and whenever you need it for all maintenance jobs. Send for new 8-page bulletin that gives full information on this small, highly portable unit that turns out all types of bituminous patch material in any quantity you need. Write Barber-Greene Co., Aurora, Ill., or use the reply card.

Davis Back-Hoe and Davis Loader

312. Literature is available from Massey-Harris-Ferguson, Inc., Industrial Division, 1009 S. West St., Wichita, Kans., describing the new Davis backhoe and Davis loader. The back-hoe can dig at right angles and to a depth of 13 ft. and detaches in 5 minutes. Both units are available for most popular makes of tractors.

Equipment For Highway Stabilization

363. The Roto-Mixer and Preparator are machines available for low-cost road building and stabilization. For operation uses and specifications get literature from Road Machinery Div., Bros Inc., Minneapolis 14, Minn., or check the handy reply card.

New Acker Vane Shear Tester

367. A bulletin describing a new inexpensive accurate technique for obtaining "in-place" shear readings of soils is available from Acker Drill Co., Inc., Scranton 3, Pa. The shear test kit has a complete set of vane test tools for testing soils to depths of 100 ft., and operating information on this kit is covered in Bulletin 700, available by checking the reply card.

Power Shovel, Crane and Backhoe All in One Unit

441. A completely hydraulic backhoe, shovel loader and crane all in one unit is described in literature available from the Badger Machine Co. Winona, Minn. Also information on front-end loaders, truck and trailer mounted hydraulic backhoes and various attachments that are useful for contractors, municipal and county engineers and state highway engineers. Check the reply card.

Complete Line of Earth Boring Machines

591. A 16-page illustrated catalog on the Hydrauger line of boring machines has been released. Field operation photos and views showing embankment drainage and pipe line installation are included in this material available from Hydrauger Corp., Ltd., 681 Market St., San Francisco, Calif.

Armco Steel Building Catalog

629. An attractive well-illustrated catalog on steel buildings for highway construction and maintenance departments is available from Armco Drainage & Metal Products, Inc., Middletown, Ohio. Check the reply card for information on types, erection, accessories and applications of these buildings.

Trencher For Ford and Ferguson Tractors

688. The mobile tractor mounted trencher digs clean trenches up to 5 feet deep and as fast as 300 feet per hour. Check the reply card for literature on models and specifications or write Earth Equipment Corp., 2036 Sacramento St., Los Angeles 21, Calif.

Advanced Tractor Design Gives Better Performance

399. The Ford Tractor offers 4-wheel stability, built-in hydraulic system, power take-off, as well as greater power, performance and economy. A complete booklet describes five tractor models in two power series, showing the latest in advanced tractor design and including many applications of equipment for saving time and money. For your copy check the reply card or write Tractor and Implement Division, Ford Motor Co., Birmingham, Mich.

Self-Propelled Ditching Machines

438. Information on a self-propelled one man operated ditching machine, model 524 T, model W-2 and a new midget ditcher, model 4 T, for light construction is now available from the Vermeer Mfg. Co., Pella, Iowa. The Model 524 T digs 8 to 24 inches wide and down to 6 feet deep, while the model 4 T digs 6 to 14 inches wide and down to 4½ feet deep. Model W-2 Ditcher digs from 2" wide up to 4" down to a depth of 30". Full data on these ditchers available by checking the reply card.

Light Duty Trucks For Construction and Maintenance

628. Pickup and stake body trucks are fully described in literature from Ford Div., of Ford Motor Co., Dearborn, Mich. Pickups are available in 6½, 8 and 9-ft. lengths. They come in standard colors and with either a 6 or V-8 engine. Rigid tailgate and steel corner posts add to the over-all body strength. The stake body trucks come in 6½, 7½ and 9-ft lengths. These units also come in 6 or V-8 engines. Check the reply card for full information.

Service Bodies to Suit Your Maintenance Needs

706. Service bodies, tailored to fit the needs of any municipal department and featuring many outstanding features of construction and design, are described in literature of Morrison Steel Products, Inc., 601 Amherst St., Buffalo 7, N. Y. The line has models to fit all popular truck chasses; ½ to 1½-ton; single or dual wheel. Be sure to check the 18 different compartment arrangements and engineered accessories offered for time-saving convenience and efficiency of your maintenance crews.

With 9-foot overhead discharge, this mixer loads trucks, or pours concrete into elevated hoppers or chutes. It's a Kwik-Mix 16-S Dandie® with tower loader attachment. Big bucket holds full mixer batch, dumps automatically at top of tower. Bucket travel and discharge are completed while the next batch is being mixed. It is controlled by a single lever, and powered by mixer engine. Tower is quickly attached, hinged for ample travel clearance. Available on Kwik-Mix 16-S, 11-S concrete mixers, 10 and 14 cu. ft. bituminous mixers. See Kwik-Mix distributor or write to us.

Mail to: KWIK-MIX CO., Port Washington, Wis. (Division of Koehring Co.)

Send literature on: ☐ tower ☐ concrete ☐ bituminous mixers

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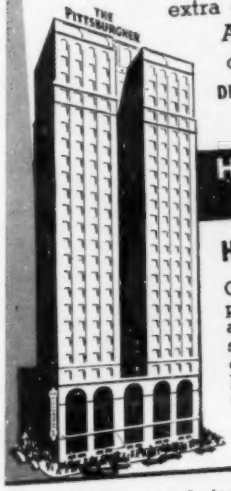

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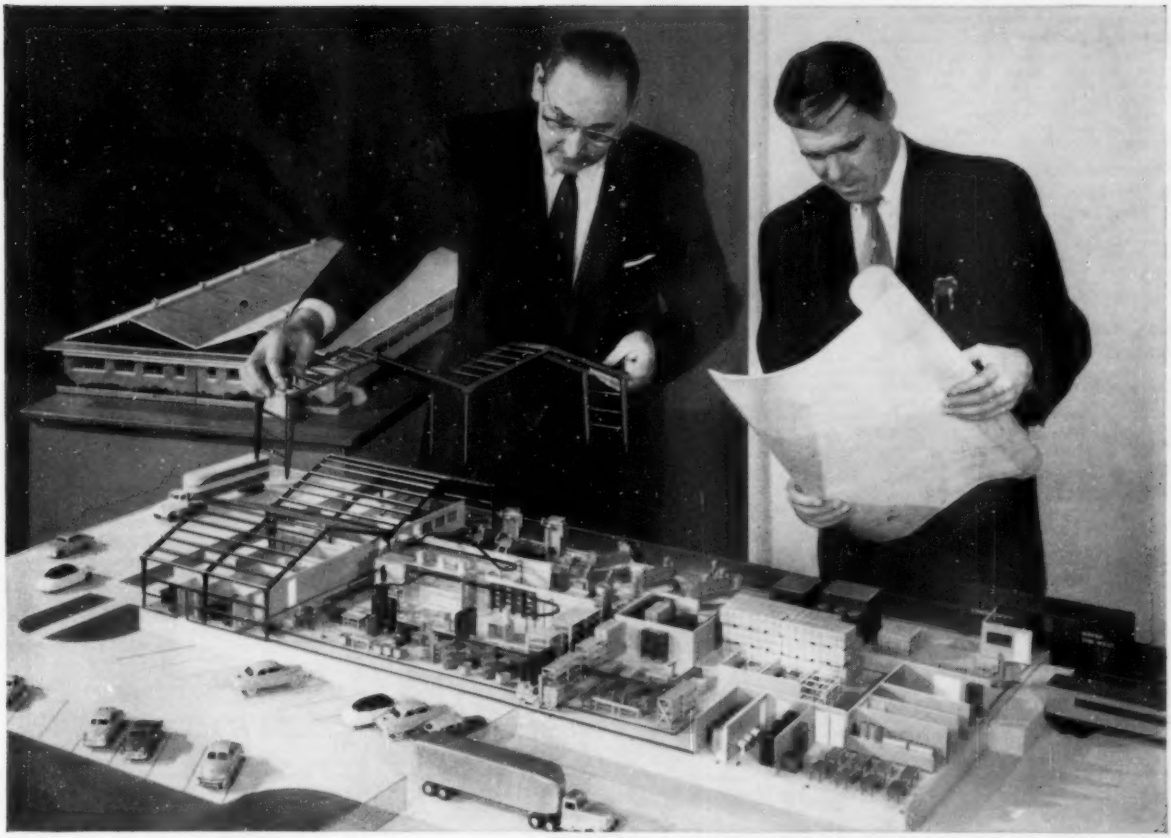
Joseph P. Duddy, Gen. Mgr.



Why engineers are choosing pre-engineered Butler buildings

Engineers are discovering that precision-made, pre-engineered Butler buildings provide a completely standardized, yet flexible system of building. They have discovered that this system enables them to substantially reduce routine engineering time. Being freed from detail work, they have been able to concentrate on planning the over-all facility. Results—they have been able to provide more efficient facilities at lower cost . . . in far less time than traditional construction methods would permit.

The clear-span construction permits wide flexibility in laying out production, materials-storage and finished-stock areas. The truss-free, gable roof not only provides clear, overhead space for the installation of utilities and materials-handling systems, but also ventilates naturally. With the installation of Butler plastic, translucent Lite*Panls, engineers can take advantage of natural daylight for much of their lighting requirements. The weather-tight construction plus vapor-sealed insulation produces a building that is easy and economical to heat or cool, because there is less heat loss than in a traditional masonry building.

For further information on the Butler Building System and how it can help you build well . . . quickly and at low cost, a wide variety of industrial facilities, phone your Butler Builder. He's listed in the Yellow Pages of your phone book under "Buildings" or "Steel Buildings" or write direct.

See our catalog in Sweet's or write for copy

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BUTLER MANUFACTURING COMPANY

7321 East 13th Street, Kansas City 26, Missouri

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To order these helpful booklets check the reply card opposite page 36.

Go-Anywhere Transportation Provided by the "Jeep" Family

377. A new booklet which graphically portrays the wide range of uses of "Jeep" vehicles in public service is now available from Willys Motors, Inc., Toledo 1, Ohio. Specifications, special equipment, accessories and plenty of photographs of the jeep in action are included. Just check the coupon for your copy.

Structural-Plate Bridge Flooring

515. A 12-page catalog on USF structural-plate bridge flooring includes a general description of the flooring, step-by-step installation photographs, drawings of engineering details, design data and specifications. Check the reply card or write United Steel Fabricators, Inc., Wooster, Ohio, for your copy.

Gar Wood Utility Ditcher Catalog

560. A catalog featuring the Gar Wood-Buckeye Model 403 utility ditcher is available from Gar Wood Industries, Inc., Wayne, Mich. It is thoroughly illustrated with mechanical views of all major components and action photos of the ditcher.

Tracto-Loaders For Fast Material Handling and Excavating

600. Tracto-Loaders with capacities from ½ cu. yd. to 1¼ cu. yd. are described fully, in a 2-color catalog available from Tractomotive Corp., Deerfield, Ill. General purpose material handling and excavating loading in confined areas are jobs performed by these machines. Check the reply card.

Better Mowing and Brush Removal

608. Fast, versatile tractor drawn Wood rotary mowers are available in a large selection of models to suit all types of municipal and highway department maintenance requirements. Be sure to investigate these units and discover how costs of roadside mowing, brush cutting, leaf mulching and park maintenance can be reduced with efficient equipment. Get full details by checking the reply card or from Wood Bros. Mfg. Co., Oregon, Ill.

Trenching Equipment Data Conveniently Assembled

212. The entire line of Cleveland trenching and backfilling equipment is now covered in a single bulletin, with material arranged for quick comparison of capacities, specifications and dimensions of all models. Twenty-four action photos graphically illustrate various job applications. Get Bulletin S-120 now for easy review of your trenching equipment needs. Just check the reply card or write to the Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Detailed Data and Prices on Optical Repeating Transits

583. Optical repeating transits are described fully in literature available from Wild Heerbrugg Instruments, Inc., Main at Covert St., Port Washington, N. Y. Check the reply card for information on design, operation and prices.

Fifty Combinations of Matching Equipment For Case-Terra Trac Tractors

617. Dump loaders, angledozers, bulldozer blader, backhoes, mowers and scarifiers are several of the attachments available for the 40 to 100 hp Case-Terra Trac crawlers and industrial wheel tractors. For complete information on the attachments and tractors write J. I. Case Co., Racine, Wisc., or check the reply card.

Warn Lock-O-Matic Hubs Manual

618. Warn Hubs make 4-wheel drive more useful, because they make it into a "free-wheeling" 2-wheel drive, as well as a 4-wheel drive. The Lock-O-matic hubs reduce front end wear, engine load and gear whine. Check the reply card or write Warn Mfg. Co., Riverton Box 6064, Seattle 88, Wash.

Literature on Cranes For Tree Removal and Trimming

722. Information on Atlas cranes is available from Atlas Crane Co., 16-18 Carleton Ave., Mt. Vernon, N. Y. Trees up to 90-ft. tall can be trimmed with this equipment. Check the reply card today.

STREET LIGHTING AND TRAFFIC CONTROL

Residential Street Lighting

228. A new 16-page bulletin on residential street lighting is now available from the General Electric Co., Schenectady 5, N. Y. Well illustrated, the bulletin, designated GEA-6316, explains how good lighting benefits a residential community and provides information on how to plan modern residential lighting installations.

Engineering Guide to Mercury Street Lighting

380. Basic engineering aspects of mercury vapor street lighting are discussed in a 35-page Engineering Guide available from Westinghouse Corp., Box 2099, Pittsburgh 30, Pa. This practical reference includes technical data on mercury lamps applicable to general lighting service, operating characteristics of the system and a discussion of methods of economic evaluation of alternative lighting systems.

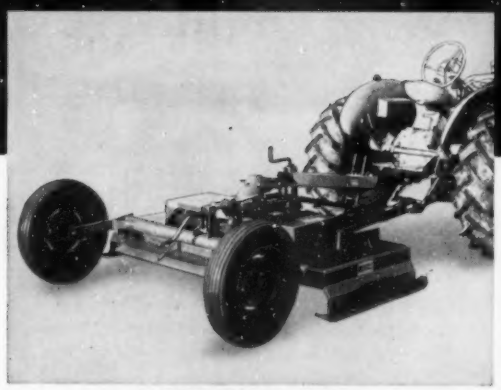
Valuable New Floodlighting Catalog

403. A 16-page catalog containing information on tapered steel and aluminum Monotube floodlighting poles designed for use in lighting outdoor sports activities, commercial and industrial areas and parking lots, has just been issued by the Union Metal Mfg. Co., Canton 5, Ohio. Easy-to-read diagrams, illustrations and applications are included. Check the reply card.

A Guide to Effective Traffic Safety

468. A 20-page catalog with hundreds of illustrations of all types of signs used on highways and in motor and pedestrian traffic areas is offered to public works officials by Traffic and Street Sign Co., 84 Foundry St., Newark 5, N.J. This convenient reference covers all your sign needs.

MOW ANYWHERE WITH A WOOD'S ROTARY



- Mows grass, shreds brush, mulches leaves
- 12 Models... for every tractor
- Quick detachable, free-swinging blades
- Trouble-free, simple construction
- Costs less to buy and operate
- All working parts enclosed

MODEL 80 (61 similar)

Make short work of grass and weeds with a Wood's Tractor Rotary. The Model 80 takes nearly a 7-foot swath... up to 4 acres an hour. Cuts close to buildings, trees and fences—saves costly hand trimming. Maneuvers easily around roadside ditches and banks. Ideal for large acreage brush shredding and leaf mulching. More dependable and less expensive than reel-type or sickle bar machines.

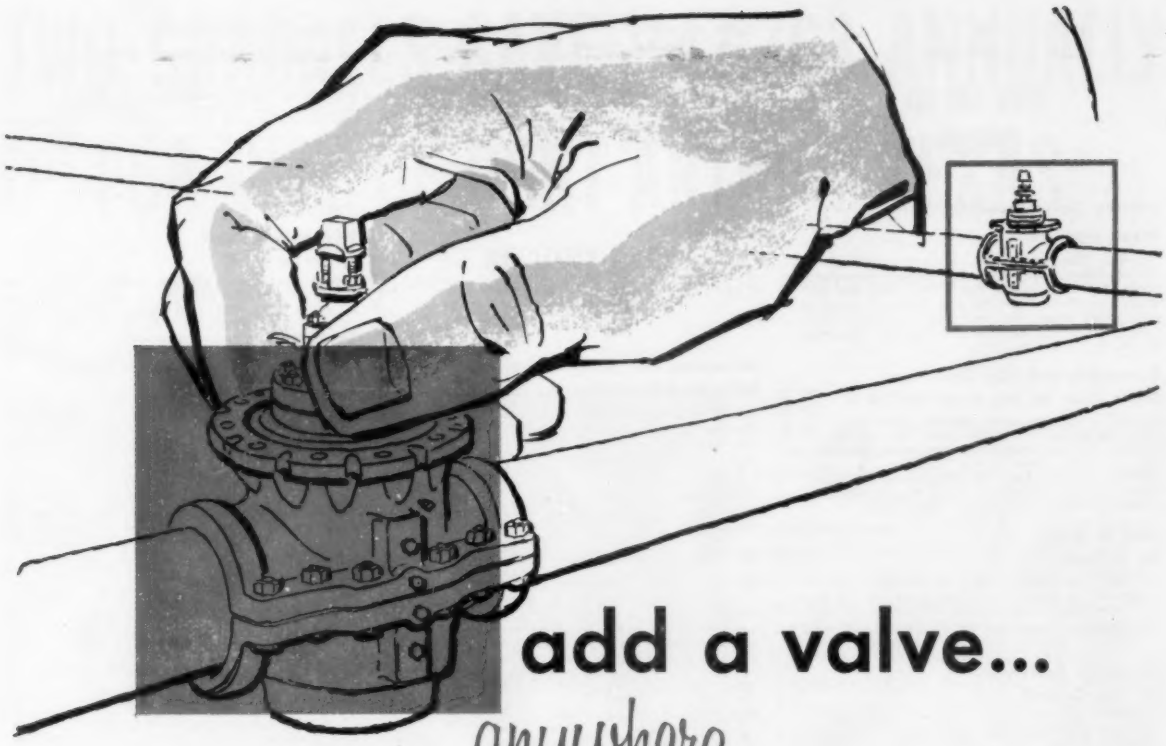
Wood's Rotaries are adjustable from ground up to 14" height (most models). V-belt drive and free-swinging blades absorb shock loads, protect both machine and tractor. Blades are quick-detachable and overlap for cleanest cutting. 15" drop-center wheels or 8" with non-pneumatic tires. Models 80, Offset 80, 61 and 114 have brackets for remote control hydraulic cylinder.

12 Models... 42" to 114" cut. 42" undermounted for Farmall Cub, Lo-Boy, Super A, 100, A-C G, M-H Pony and Pacer. 42" rear-mounted for Fast Hitch Cub and Lo-Boy. 61" and 80" rear-mounted for Fast Hitch Farmalls Super C, H, M, 200, 300, 400, I-300 (all use 3 pt. adapter), and all standard 3-point hitch tractors (Ford, Ferguson, Oliver Super 55, etc.). 61", 80", and 114" drawbar pull-types for any 2, 2-3, and 3-4 plow tractors. 80" offset model (2-3 plow) for working under trees.

R

Send for Complete Information

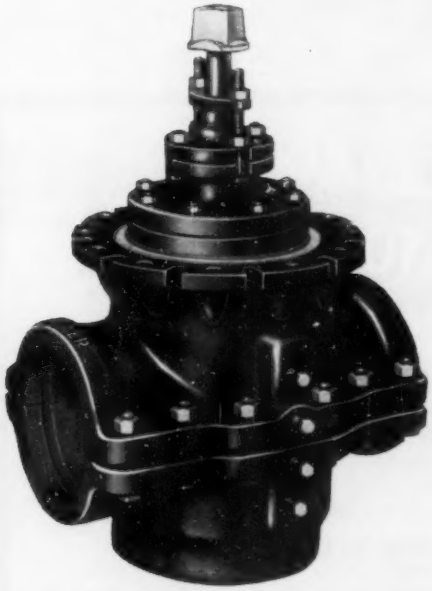
WOOD BROTHERS MFG. CO. 187 South 4th Street OREGON, ILLINOIS



add a valve...

anywhere...

with MUELLER® INSERTING VALVES and equipment



H-800 Inserting Valves
For 4", 6" or 8" mains. Working pressure to 125 p.s.i. max. Equipment required: Drilling machine, H-810 inserting equipment.

You can install needed control points in the line – without a shutdown – with Mueller Inserting Valves. Inserting Valves are added to line under pressure without loss of fluid or customer inconvenience.

Valve sleeve is attached to the main... the line drilled with a Mueller "C-C" or "C-1" Drilling Machine ...valve body is inserted and fastened...and line is then equipped for precise flow control. The Mueller Inserting Valve is identical to job-proven Mueller Gate Valves with four-point wedging mechanism.

Use Mueller Inserting Valves and Equipment to add the valves you need.

Your Mueller Representative has further information. Call on him or write direct.

MUELLER CO.
DECATUR, ILL.
Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

MUELLER CO. 100th YEAR QUALITY SERVING the Water and Gas Industries

Since 1857

To order these helpful booklets check the reply card opposite page 36.

SNOW AND ICE CONTROL

Uniform Salt Spreading Saves Material

42. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on their spreader and table of material application rates. Use reply card or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Reversible and Roll-Over Type Snow Plows for any Depth of Snow

389. Village, city, county, state and airport officials send for the latest information on Frink's two catalogues on reversible trip-blade and roll-over snow plows. Complete assembly details, specifications and operation are completely outlined. Write to Frink Sno-Plows, Inc., Clayton, Thousand Islands, New York.

How to Make Icy Surfaces Safe

455. A bulletin on how calcium chloride works in ice control and directions for its use has been made available by Wyandotte Chemicals Corp., Wyandotte, Michigan. Other uses of calcium chloride are fully outlined.

Spreading Equipment For Ice Control

543. An ice control catalog describing the full line of Baughman ice control spreading equipment has been released by Baughman Mfg. Co., Jerseyville, Ill. Included are illustrations and descriptions of truck-mounted spreader bodies, tail gate spreaders, dump body and pull type spreaders and gravity feed spreaders. For your copy of this helpful and interesting booklet check the reply card today.

Data on the "Over-Cab" Snow Loader

728. Unit can permit single or double lane loading with trucks traveling in either direction and the 16-ft. conveyor is fully hydraulically operated. For specifications write N. P. Nelson Iron Works, Inc., 852 Bloomfield Ave., Clifton, N. J., or check the reply card.

REFUSE COLLECTION AND DISPOSAL

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy reply card.

New M-B Packer Body Designed for Maximum Payload

309. The M-B Packer Body, designed to provide maximum payload on a minimum size, low-cost truck, features effective, simple compaction system; provides easy loading, positive discharge, all safety features. Available in 12-14-16, 20, 24 cu. yd. capacities. Get all the facts from M-B Corp., New Holstein, Wis.

Methods and Benefits of Sanitary Landfill

409. Information on Sanitary landfill methods, organization and necessary equipment with which to carry out the job is available from the Construction Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis. Check the reply card today.

Catalog on the Flynn and Emrich Incinerator Stokers

180. This catalog describes the Flynn and Emrich Incinerator stokers as to design, feeding capacities and loadings. Plenty of drawings of the stokers and photographs of incinerator plants under construction and in operation are included. Also, there is a good section on the incinerator history. Check the reply card today for catalog No. 1702 from Flynn and Emrich Co., Holiday and Saratoga Sts., Baltimore 2, Maryland.

How to Construct A Sanitary Fill

331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 15, Wis. Get your copy by checking the reply card; you'll find this booklet both interesting and valuable.

Solution To Three Municipal Problems

598. Many municipalities can now solve the waste disposal problem and prevent air pollution without heavy financial burden. Incineration plants are erected from 1 to 40 tons per hour and they also can be designed to generate steam. For full details write Incineration Engineering & Power Co., A Div. of Coastal Oil Co., 744 Broad St., Newark 2, N. J., or check the reply card.

RECREATION

How to Equip Your Parks and Playgrounds

414. A handsome 60-page illustrated catalog showing a full line of extra heavy duty playground, pack-picnic and dressing room equipment, plus many related items, is now available from American Playground Device Co., Anderson, Ind. Complete specifications, construction features, prices and details of labor and materials needed for installation are included. Check the reply card.

PROGRESSIVE CITIES SELECT

F&E INCINERATOR STOKERS

PATENTED

Designed and manufactured by a century-old concern with 40 years' experience in designing, engineering and completely manufacturing hydraulically-powered stokers.

"F&E" Hydraulically-Powered Stokers are the most talked-of incinerator advancement in the field today.

Should you wish to see an "F&E" Incinerator Stoker in operation and get firsthand information on their revolutionary performance, we will be pleased to advise where the installation nearest you is located.

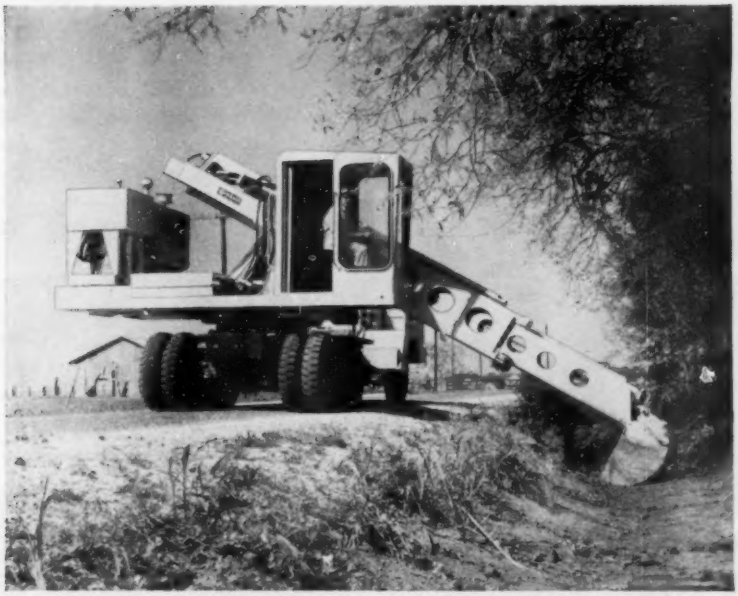
F&E

FLYNN & EMRICH CO.

301 NORTH HOLLIDAY STREET • BALTIMORE 2, MARYLAND

TWO GRADALLS SAVE $147,763 ANNUALLY FOR CITY OF PORT ARTHUR, TEXAS

Handle complete surface drainage maintenance



Gradalls handle complete maintenance of surface drainage systems for City of Port Arthur—saving 76,960 man hours a year.

Port Arthur also uses its Gradalls on water and sewer department improvement projects.

HOW MUCH does labor cost? An analysis of your own cost records may be quite revealing—as the City of Port Arthur, Texas, found out recently. After a thorough cost analysis on the maintenance of their surface drainage systems, they discovered the use of their two Gradalls versus hand labor resulted in an annual savings of $147,763!

M. C. Creswell, Port Arthur's Supt. of Public Works, stated, "Prior to the purchase of our two Gradalls, we used 55 men and 8 trucks in an unsuccessful attempt to maintain our surface drainage. Now, with the Gradalls, 18 men and 6 trucks, we do more work and *do it better.* This reduction in manpower —76,960 man hours a year—means a cost savings to us of $147,763 annually. So, it didn't take long for the Gradalls to pay off their cost. It also enabled us to transfer 37 men into undermanned departments."

Recently, Port Arthur put one of their Gradalls full time on a sizable program of improvement projects. As work progressed, it often became necessary to use the second Gradall to keep operations running efficiently and maintain work schedules. So to keep all programs up to date, the City of Port Arthur has just purchased their *third* Gradall.

Why not arrange for a field demonstration with your nearest Gradall Distributor? Let him show how this multi-purpose machine can cut your costs, eliminate costly, time-consuming hand labor and speed job completion.

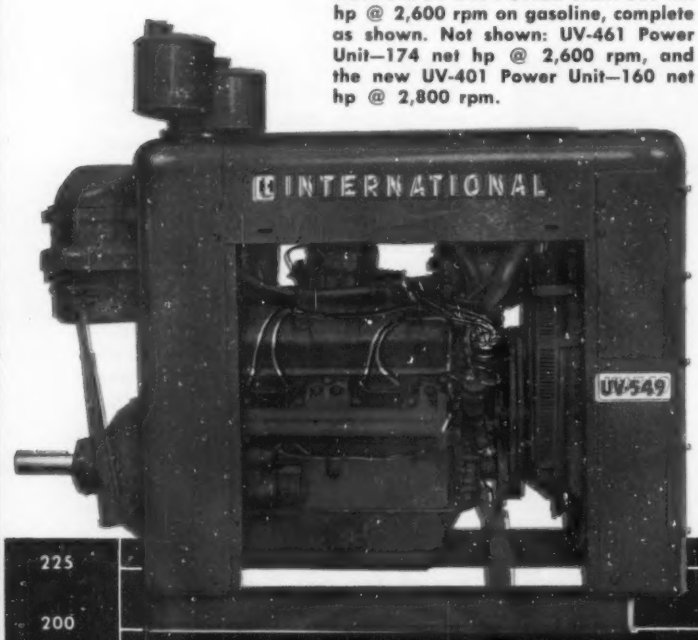
Gradall®
DIVISION OF WARNER & SWASEY Cleveland
® Reg. U.S. Pat. Off.
PRECISION MACHINERY SINCE 1880

PROVEN BY 11 MILLION HOURS OF DEPENDABLE FIELD OPERATION

NOW..3 new International V-8's

Now you have an even wider selection of economical International gasoline or LP-gas power for your driven machines—three new power-packed, compact V-8's—the UV-549, UV-461, and the UV-401.

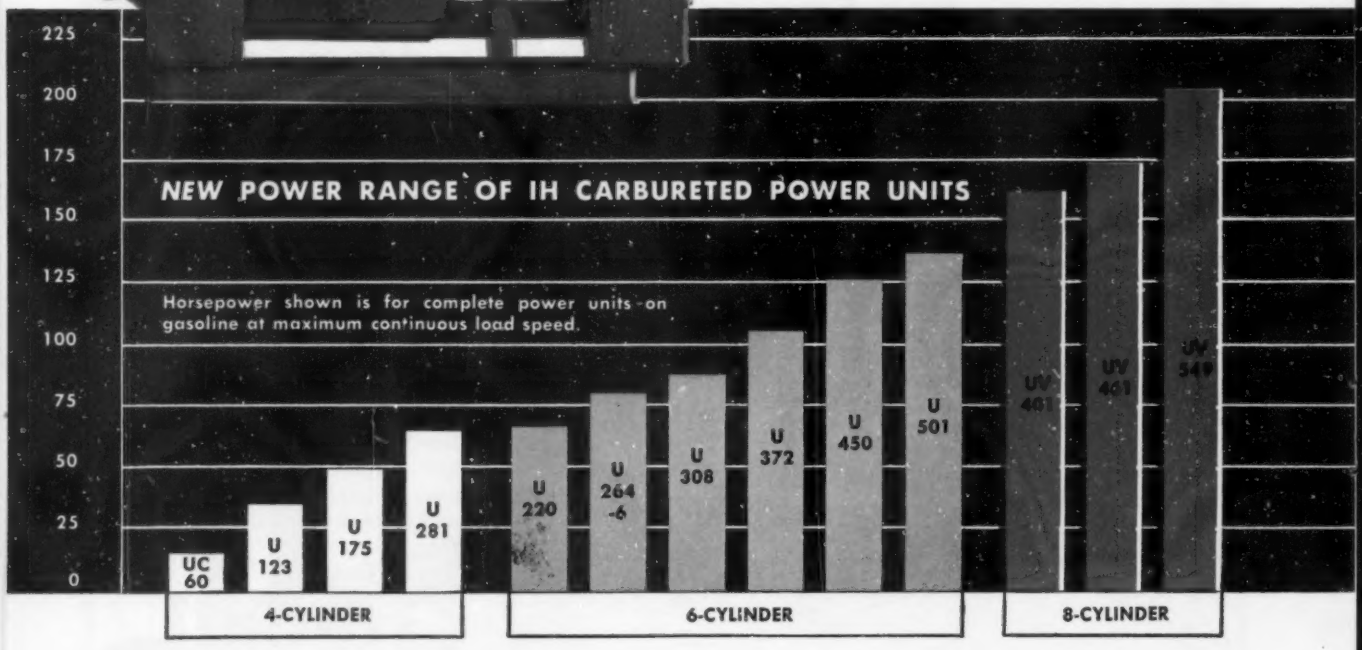
NEW V-8 UV-549 POWER UNIT. 208 net hp @ 2,600 rpm on gasoline, complete as shown. Not shown: UV-461 Power Unit—174 net hp @ 2,600 rpm, and the new UV-401 Power Unit—160 net hp @ 2,800 rpm.



These new models increase the International carbureted line to 13 models ranging from 16 to 208 hp on gasoline at continuous rated rpm, complete with regular accessories, fan and radiator. As stripped engines, they develop from 17 to 257 hp. LP-gas power is approximately the same as gasoline.

And just look at the standout V-8 features that help you cut your operating costs: rigid, Y-shaped block; short-stroke, heavy-duty, cam-ground, 4-ring aluminum pistons; big, smooth-running, counterbalanced, tocco-hardened, 5-bearing crankshaft; large-area, long-life, tri-metal, replaceable bearings; combination full-flow, by-pass filter for long-life pressure lubrication; full-power, down-draft carburetion; oil cooler; and a 12-volt electrical system.

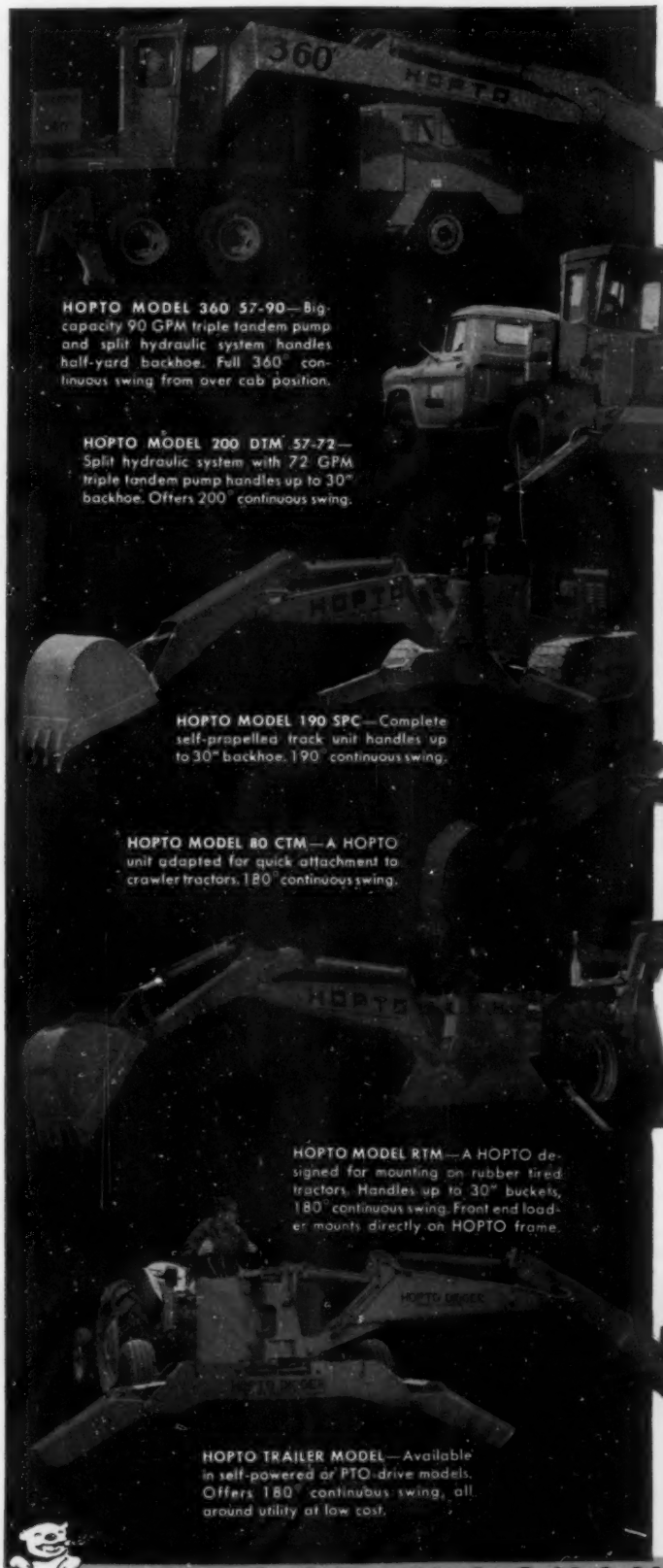
See the man who can expertly fit one of these 13 extra-value carbureted engines to your job—your nearby International Power Unit Distributor or Dealer. You'll discover his after-sale service, his shop and field service facilities, his parts stock is outstanding in the industry.



INTERNATIONAL® CONSTRUCTION EQUIPMENT

International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Power Units . . . Motor Trucks . . . Farm Tractors and Equipment.



YOU NAME THE JOB!

HOPTO MODEL 360 57-90—Big capacity 90 GPM triple tandem pump and split hydraulic system handles half-yard backhoe. Full 360° continuous swing from over cab position.

HOPTO MODEL 200 DTM 57-72—Split hydraulic system with 72 GPM triple tandem pump handles up to 30" backhoe. Offers 200° continuous swing.

Heaviest-duty, Largest GPM Hydraulic System Available

THERE'S A HOPTO MODEL FOR IT

HOPTO MODEL 190 SPC—Complete self-propelled track unit handles up to 30" backhoe. 190° continuous swing.

HOPTO MODEL 80 CTM—A HOPTO unit adapted for quick attachment to crawler tractors. 180° continuous swing.

HOPTO MODEL RTM—A HOPTO designed for mounting on rubber tired tractors. Handles up to 30" buckets, 180° continuous swing. Front end loader mounts directly on HOPTO frame.

HOPTO TRAILER MODEL—Available in self-powered or PTO-drive models. Offers 180° continuous swing, all around utility at low cost.

GET THESE HOPTO ADVANTAGES:

- Fast-cycling, completely hydraulic operation—no clutches, brakes, drums or cables.
- Simple, feather-touch hydraulic controls.
- Rugged hydraulic systems with generous overload factors, large oil reservoirs, heavy-duty pumps and valves.
- Wide selection of interchangeable backhoe or shovel buckets, log grapples, magnets or crane attachments.

STILL MORE MODELS

HOPTO offers 3 models for truck mounting, self-powered or PTO-drive trailer models, and the self-propelled rubber-tired Model SPR.

Write today for complete information or see your HOPTO Dealer!

BADGER MACHINE COMPANY

DEPT. P • WINONA, MINNESOTA

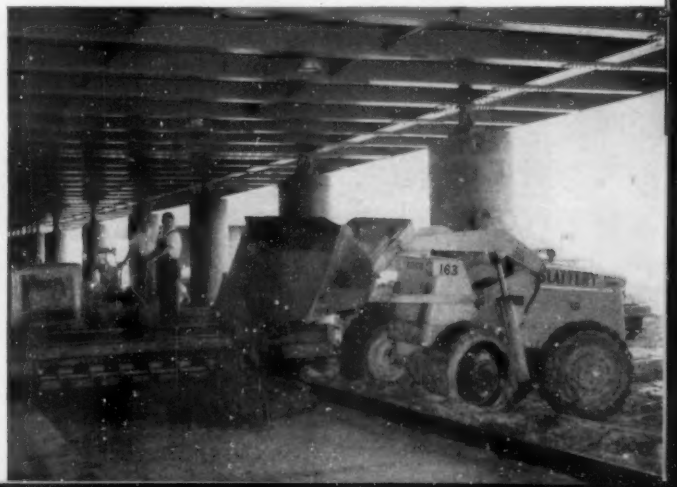
SOME UNUSUAL WAYS

Michigan Tractor Shovels are saving time and money for road builders around the country

Feeds portable crusher—Making good use of its high lift, Michigan Model 125A digs and dumps raw bank gravel into hopper of 100-ton-per-hour base material plant. Photo comes from Southern Hills Inc. pit near Dayton, Ohio, where the 2 yd Michigan did the work of a more expensive, less versatile, far less mobile excavator-crane.

Grades shoulders—Special side bucket attached to Michigan 175A grades 3 ft shoulder next to newly-poured slab. Unique rig does jobs not possible with grader drop-blade . . . including filling holes, distributing gravel, removing spoil. Attachment, designed by Villa Contracting Co, is helping widen 27 mi of N.J. Garden State Parkway.

Pours concrete—Hauling concrete in Michigan Tractor Shovel bucket, Slattery Rock Corp. solves problem of laying 6 lanes of New York's Deegan Expressway under low viaduct. Two of these maneuverable "buggies" needed only 4 hours, 200 to 250 trips to pour 800 ft of each 12 ft lane.

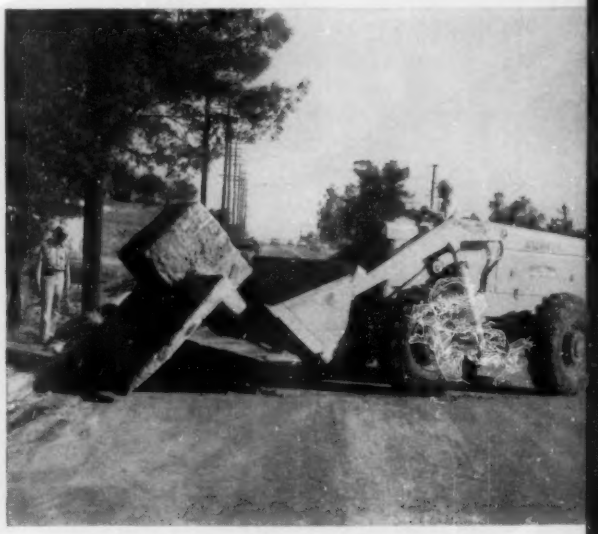


Earle Vinnedge, Worthington Corp., and Lou Motz, Pumping Station Supervisor, Cincinnati Main Pumping Station, check performance of Worthington

Carries pipe—One of Peter Kiewit's Michigans serves as all-around handyman on company's Indiana Turnpike contract. This 102 hp model lifts up to 11,000 lbs, carries, 5,500 lbs at 4 mph. Note excellent all-around visibility given operator.

Breaks, loads asphalt—Before resurfacing street in Worcester, Mass., Contractor Charles Chaffee uses 1¼ yd Michigan to strip old asphalt. No "ramming" is required—powerful breakout quickly shatters paving.

Cleans pavement—Highway must stay open said Nashville officials, so Wright & Lopez do cleanup with small, agile 16 cu ft Michigan. Only 4'2" wide, 10'8" long, unit works rapidly, doesn't block traffic, doesn't damage newly-set pavement.

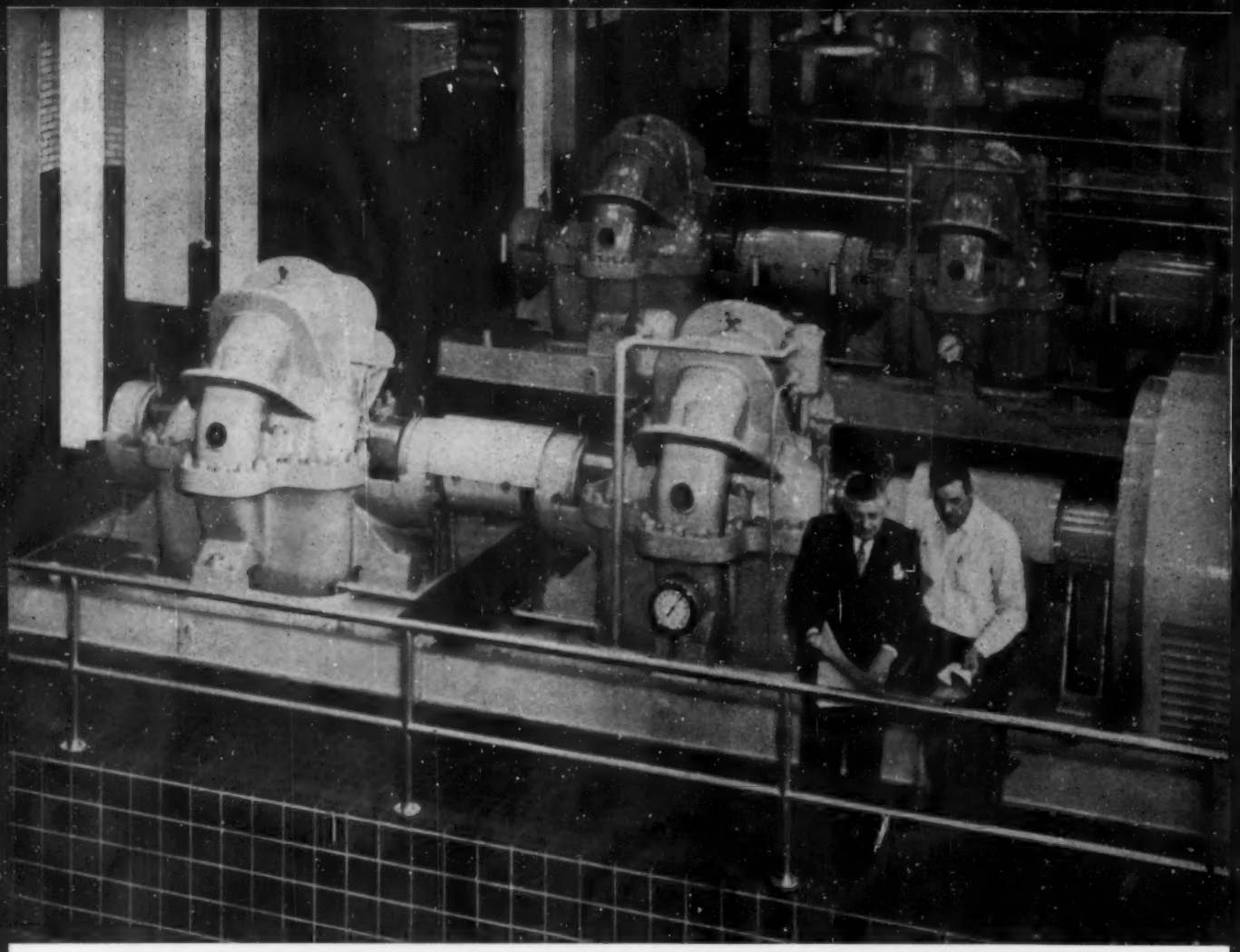


Removes sewer cover—When other big loaders failed, Kirby-Erwood's 133 hp Michigan succeeded in prying off this 2-ton concrete cover. Assignment was part of cleanup before widening Los Angeles freeway.

Digs shot rock—Time studies proved to Cummings-Roberts, Darby, Montana, that this 2¾ yard Michigan would outproduce crawler-loaders in both pit-run and shot-rock, despite narrow benches, 7000' altitude.

Breaks, loads concrete—On New York City street repaving job, Triboro Asphalt Co. breaks and loads 4 to 6-inch concrete slab with this 133 hp Michigan Model 175A.

Earle Vinnedge, Worthington Corp., and Lou Motz, Pumping Station Supervisor, Cincinnati Main Pumping Station, check performance of Worthington pumps installed in 1957. Earle represented one contact—one responsibility for the pumping equipment. We believe you too will find it advantageous to deal with the Man from Worthington. Cincinnati Water Works' Main Pumping Station. Consultants: Black and Veatch, Kansas City, Mo.



.5 MGD TO 500 MGD

Any size, you have more to choose from with Worthington

These Freflo sewage pumps typify hundreds of Worthington equipped treatment plants.

You benefit two ways when you deal with Worthington – world's leading builder of public works equipment.

An unbiased recommendation. Because Worthington makes all types of pumps and drives and a complete line of engines, compressors, comminutors and auxiliary equipment, you get equipment recommendations based on a broad look at all ways of doing the job. You have a choice, for example, of either vertical or horizontal centrifugal pumps. In many other ways – some small, some major – the Worthington line lets you tailor the equipment to the specific requirements of your plant.

Unit responsibility. You do business with one company—eliminating delays and inconvenience that can occur when you are forced to coordinate the efforts of several suppliers. Unit responsibility by Worthington saves you time and money.

Small or large, you'll do better by consulting Worthington. For more information call your nearest Worthington District Office. Or write to Section W-71, Worthington Corporation, Harrison, N. J.

WORTHINGTON

INVISIBLE WATERTIGHT BARRIER

The glass walls of a modern aquarium form an invisible barrier which contains the many tons of water in which marine life can be observed safely by the public.

An equally watertight barrier, invisible in the finished product, exists in every high pressure Lock Joint Concrete Pipe. It is the impermeable, welded sheet steel cylinder molded into the pipe's dense concrete wall.

Every one of these cylinders is subjected to a rigorous hydrostatic test which places a stress of up to 25,000 psi in the steel. During the test every welded seam is carefully examined for leaks, and only those cylinders which are completely watertight are accepted. This is only one of the many quality control measures observed throughout the production of Lock Joint Concrete Pressure Pipe.

Can you guess approximately how many bodies of average priced automobiles could have been made from the steel cylinders required in the construction of the 254,500′-48″ section of the Saginaw-Midland water supply line? If you're stumped, the answer appears in the picture above.

LOCK JOINT PIPE CO.

East Orange, New Jersey

Sales Offices: Chicago, Ill. • Columbia, S. C. • Denver, Col. • Detroit, Mich. • Hartford, Conn. • Kansas City, Mo. • Perryman, Md.

Pressure • Water • Sewer • REINFORCED CONCRETE PIPE • Culvert • Subaqueous

LOWEST PRICED
BIG
DITCHER
ON THE MARKET!

VERMEER 524T
Pow-R-Ditcher

Acclaimed by contractors everywhere, the 524T delivers more ditch at a much lower dollar cost. This rugged, quality-built unit is especially designed for wide foundation footings, gas, water and sewage lines. Digs 8" to 24" wide at speeds up to 15' per minute. Handles most ditch-digging jobs at a fraction of the cost of larger, more expensive trenching and ditching machines.

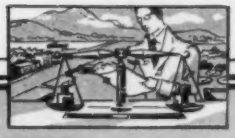
Model 4T
Pow-R-Ditcher

Has same size moving parts as the 524T but digs smaller 6" to 14" ditch. Ideal for the light construction field.

Write For Literature and Low Prices on the Complete Vermeer Pow-R-Ditcher Line

Another smaller Pow-R-Ditcher also available. Visit your Vermeer dealer for a demonstration or write for all the facts. Check the Pow-R-Ditcher before you buy. You'll like the quality AND THE PRICE!

VERMEER
MANUFACTURING CO.
1439 W. WASHINGTON • PELLA, IOWA



LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Is Shopping Center Sewer a "Private Connection"?

How to dispose of the water from Waterford Township? That is the question—in *City of Pontiac v. Waterford Township*, 346 Mich. 443, 78 N.W. (2d) 109, a Michigan case decided Sept. 4, 1956.

The case involved the construction of a sewer, and also the construction of a sewerage contract between the City of Pontiac and Waterford Township. Under the terms of the contract, the City of Pontiac granted a license to the township of Waterford, permitting the township to connect a portion of its sewer system to the Pontiac sewer system. The contract prohibited any "improvements or enlargements" on the township's sewerage system without the approval of the City of Pontiac.

In 1954 the Pontiac Shopping Center, Inc., acquired an 80-acre tract of land in the township, and began the construction of a shopping center of 20 stores. An 8-inch sewer was installed by the company to serve all the stores. This was the same size as the main sewer of the township into which the company was planning to connect its sewer.

The City of Pontiac sought to enjoin this connection, which would have permitted the entry of sewage from the shopping center into the City's sewer system. The defense of the township was that this was not an "improvement or enlargement" of their system, but simply the connection of a private sewer into the already existing township sewer system. According to the township, there was no reason to treat this connection any differently from the connection of a group of individual drains from private residences, as would occur if there had been a subdivision of new residences.

The trial court held,—the Supreme Court of Michigan affirming,—that this was an enlargement or improvement of the township's sewer system, and enjoined the connection.

That still leaves us with the question of how to dispose of the water from Waterford Township. Perhaps the way to do it is to install a separate connection from each store.

The Rains Came—Four Times

There was a famous flood in the Bible, but in Michigan, Farmer Nemeth's land was flooded four times,—in 1948, 1949, 1950, and 1951. *Nemeth v. County of Genesee*, 347 Mich. 65, 78 N.W. (2d) 634, decided Oct. 1, 1956.

According to Farmer Nemeth, who lost about $9000 worth of crops because of these floods, it was all caused by the County of Genesee, especially their Drain Commissioner. According to the County, it wasn't *their* fault, but an Act of God. The Michigan Supreme Court held that floods are caused by the Lord, and intimated that they have no jurisdiction in such cases. In other words, Farmer Nemeth's prayer for relief, they said, had been directed to the wrong authority.

Strangely enough, Farmer Nemeth's land had *not* flooded before 1948, even though it is believed that the Lord had been sending rain into Michigan prior to that date. According to Farmer Nemeth, the County in 1946 widened, deepened, and extended a drain passing near his farm, without compensating enlargement of the outlet. The outlet was originally a concrete culvert 4 feet wide and 5 feet high. It was replaced with a 60-inch dia. pipe.

The defendants' answer was based on the laws of hydraulics. They said that a 60 inch circular tube will handle slightly more water than a 4 foot by 5 foot rectangular culvert, even though it has a slightly smaller cross-sectional area.

According to the trial judge, "If the drain commissioner or the

JOHN DEERE Has the ★Answer to Cutting Tractor Costs

★ JOHN DEERE CRAWLER
(with Loader)

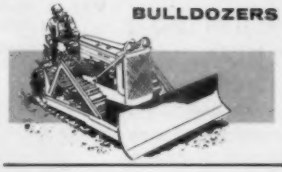
Scarify, dig, shovel, and load at lower costs than you ever believed possible. This 30 h.p. John Deere quality-built crawler unit is fast-loading, easy to handle, works well in tight places.

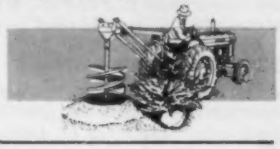
★ JOHN DEERE WHEEL-TYPE UTILITY
(with Loader and Backhoe)

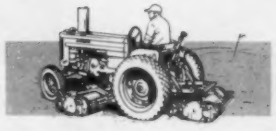
A fast-moving, fast-working versatile unit that will speed your jobs, cut your costs to the bone. A gallon of gas (or less) on a good hour's work!

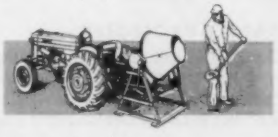
IF you really want to reduce your costs of doing business, replace those oversize fuel-eating tractors with modern, efficient John Deere Crawler or Wheel-Type Industrial Power. Your nearest John Deere Industrial Dealer will help you select the equipment that fits the work you have to do. Look for his name in the yellow section of your phone book.

The John Deere Credit Plan makes it easy for you to pay for equipment as it earns money for you.


BULLDOZERS


HOLE DIGGER


GANG MOWERS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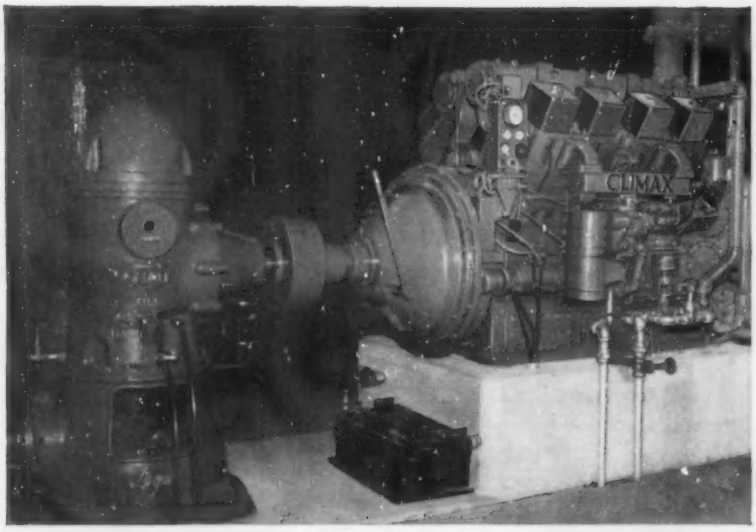


IMPORTANT FACTS ABOUT CLIMAX STANDBY ENGINES!!

CHOICE OF FUELS—
All models operate with equal efficiency on gas, butane or gasoline.

FAST, EASY STARTING—
Climax engines take over the complete load within seconds after normal utility power fails. If the starting system is manual, you merely press a button on the instrument panel...if automatic, the engine starts immediately.

SIMPLE TO OPERATE—
All instruments and controls are located at the sides of the engines . . . easy to read . . . easy to adjust.

SIMPLE TO MAINTAIN—
Accessories are within "arm's reach" to allow quick inspection and adjustment. Crankcases and engine bases have large hand holes on each side for easy access to all working parts.

SAFETY PROTECTED—
Safety devices are standard equipment on all models and automatically protect the engines against high water temperature and low oil pressure. An overspeed governor can also be furnished, if required.

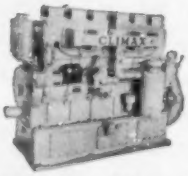
ACCESSORIES—
Various types of cooling and starting systems, mufflers, etc. are available to make each engine suitable for a particular application.

LONG ENGINE LIFE—
Climax engines are constructed of the finest metals, alloys and component parts available. Any model will give years of service if properly maintained.

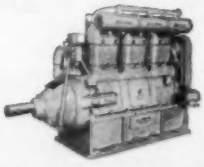
Write today for complete information, bulletins or engineering consultation

V-125—12 cylinder, 605 max. H.P. at 1200 R.P.M.
V-122—12 cylinder, 520 max. H.P. at 1200 R.P.M.

V-85—8 cylinder, 390 max. H.P. at 1200 R.P.M.
V-80—8 cylinder, 340 max. H.P. at 1200 R.P.M.



K-75—6 cylinder, 302 max. H.P. at 1200 R.P.M.
K-67—6 cylinder, 265 max. H.P. at 1200 R.P.M.



R-165—6 cylinder, 192 max. H.P. at 1200 R.P.M.
R-110—4 cylinder, 130 max. H.P. at 1200 R.P.M.

CLIMAX ENGINE MANUFACTURING CO.
208 South LaSalle Street • Chicago 4, Illinois
Factory—CLINTON, IOWA • *District Office*—DALLAS, TEXAS
In Canada—Canadian Fairbanks-Morse Co., Ltd., Montreal and 16 Branches

county or someone in responsibility could anticipate at any time the volume of water that might come down, there might be some question they should try to take care of the situation, to take care of the water at that time, if they could anticipate what the Lord is going to do in sending rain." But since the county had received no such prior information, they couldn't be held liable.

In the Supreme Court of Michigan, three of the eight judges agreed that as to the *first* flood, the losses were attributable to an act of the Great Architect, but as to the next three years, they thought the County should have taken the hint. However, the other five judges of the Supreme Court held that the Drain Commissioner could not have foreseen, ***when he did the work,*** that there would be "flash floods" in the next few years, and so there was no liability.

Thus, Farmer Nemeth has obtained no relief from the laws of hydraulics or the laws of Michigan, and he will have to appeal to a higher law.

Lights Out

In *Terrill v. ICT Insurance Co.*, 93 So. (2d) 292, a Louisiana case decided Feb. 4, 1957, suit was brought by the driver of an automobile against the City of Oakdale and the Central Louisiana Electric Co. for damages caused his auto in a collision with another auto when the traffic lights at an intersection in the City were not functioning properly.

The case against the City was dismissed on the ground that maintaining traffic lights is a governmental function, so that the City is immune from liability for its negligence. This is in accordance with the general rule.

The case against the Electric Co. was also dismissed on the ground that the negligence of the company in failing to keep the lights in working order was not the proximate cause of the plaintiff's injury. In the first place, it takes two to make a collision, and the Electric company was not one of them. And in the second place, just because the lights are out, it doesn't mean that it's time for drivers to go to sleep.

• • •

Highway Maintenance in Illinois

In 1955, 14,297 miles of highways in Illinois were maintained under the State's Bureau of Maintenance. The total maintenance and operation costs (including traffic operation) were $23,332,335. The cost of the annual snow removal and ice control was $3,238,918, or a cost of $226.55 per mile.

NEED ENGINEERS?

LOOK AROUND...

YOU'VE GOT THEM

Yes. Well-trained, fully qualified engineers, experienced in your operations. Available to you without the trying and costly job of recruiting.

Who and where are these engineers? They are your own men in your own operating departments. Ambitious, imaginative, well-trained men. Men who want to work to their full engineering capacity. Who want to do a better job for you. But they are chained to technical detail.

I.C.S. can help free these men for you. And while the job is being done, employee morale gets a big boost.

The I.C.S. Co-operative Training program offers your company an opportunity to prepare employees to serve as engineering aides who can free your key people for the more vital jobs they should do—and in most cases *prefer* to do.

I.C.S. courses are tailored to your needs. They are easily fitted into both your schedule and your employees' schedules. And they have 66 years of educational experience behind them.

If you need engineers for your sanitation, water, highway or other public works departments write to us. We will be happy to have one of our representatives help you analyze your problem and plan training for men capable of carrying more of your engineering load.

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Without cost or obligation please send me: **1.** Catalog of I.C.S. Courses in Civil Engineering, **2.** Booklet describing how I can train my men with I.C.S. Courses.

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Helps you take a big bite off construction costs!

New idea in "job-applied" pump selection shows how to speed construction projects—keep "on schedule"—by moving more water efficiently from job to job.

Barnes engineers developed a broad line of heavy-duty pumps that meet practically all liquid-moving applications contractors encounter—in excavations, mines, on highways and general construction projects.

Then we went a step further. To help you avert costly delays we charted the operations you perform regularly . . . and matched them up with the pumps that do those jobs better, faster, at lowest cost.

It's all in a handy *Construction Pump Selector* we offer you free. Follow the key numbers and stay on the track to extra profit on every project!

Ask your Barnes Pump distributor or write us today, Dept. /-117.

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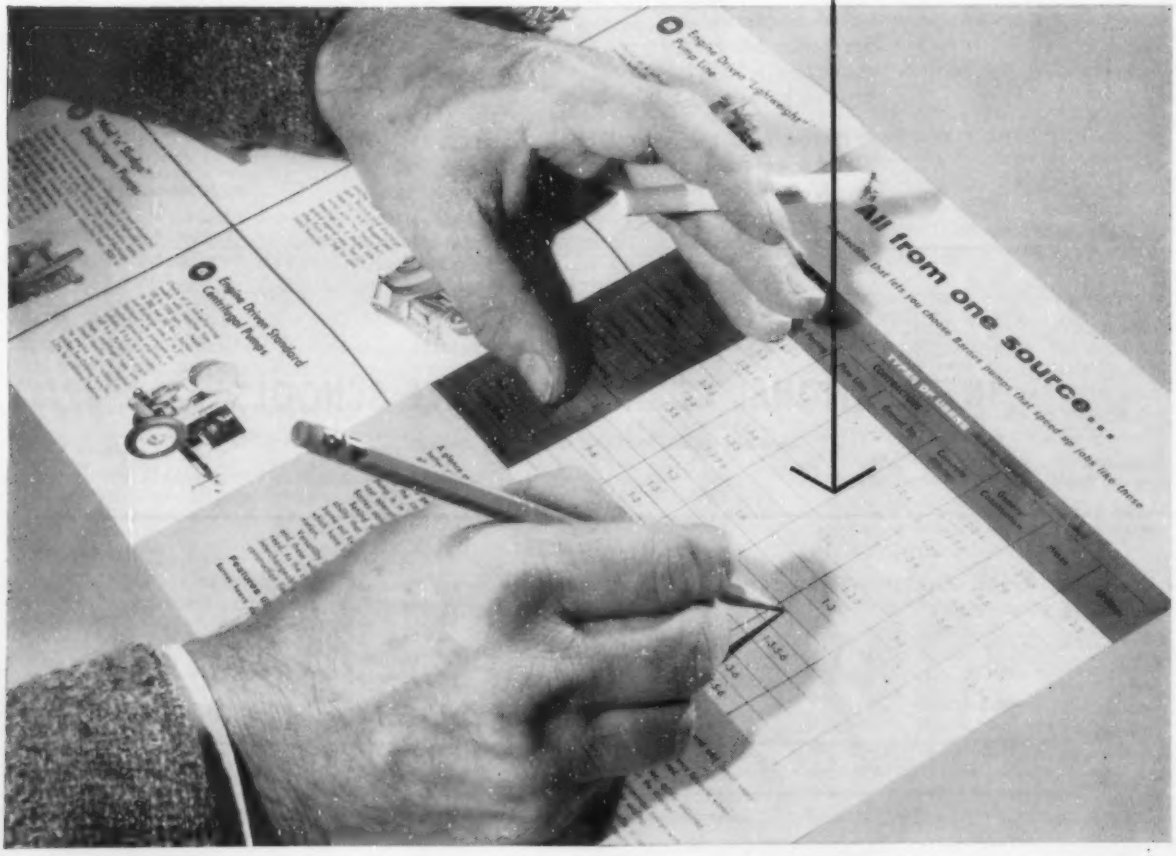
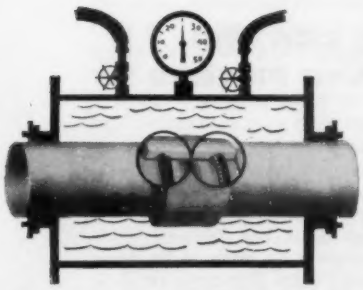


THE MODERN PIPE JOINS FAST, STAYS TIGHT

"K&M" ASBESTOS-CEMENT PIPE and exclusive FLUID-TITE Coupling



Infiltration of external fluids and entrance of roots are eliminated by "K&M" FLUID-TITE Coupling installed with "K&M" Asbestos-Cement Sewer Pipe. Here, external water under 25-psi pressure (far beyond ordinary field conditions) has no effect on the FLUID-TITE joint.

For gravity sewer systems, "K&M" Asbestos-Cement non-pressure Pipe is the modern answer to the need for low-cost, permanent water-tight connections. The exclusive FLUID-TITE® Coupling makes installation quick and easy—and permanent.

No special equipment; little skill needed. Just two easy steps: 1. Lubricate rubber rings; 2. Slide pipe into coupling. The FLUID-TITE principle keeps piped fluids in, keeps external fluids and roots out, and allows pipe-laying that keeps up with the trench digger in speed. Installation costs go down when you specify the *modern* pipe and coupling system . . . "K&M."

Learn the advantages of the *modern* pipe from the K&M distributor. Or write to us for complete information.

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K·M
BEST IN ASBESTOS

Guthrie Water Works Operators...

DIAL the FLOW RATE... then forget it!

Control panel for one of Guthrie, Oklahoma's, 4 Rapid Sand Filters. Instrument dials (L to R) show loss of head, effluent flow, and rate of backwash. Air switches at bottom are used to shift control functions.

thanks to FOXBORO PNEUMATIC CONTROL

"Dial the set point and flick a pneumatic switch". That's how they control effluent and backwash on rapid sand filters at the new Guthrie, Oklahoma, Water Treatment Plant. No valves to crank — no need to check the filters visually! Foxboro does it all quickly, dependably — automatically.

With Foxboro centralized Rapid Sand Filter Control, filtration rates can be set: remotely, from a panel in the operating gallery (as at Guthrie); or, automatically, from a sedimentation basin or clear well.

Find out how Foxboro Pneumatic Control can save time, labor, and money. For full details, write for illustrated Bulletin 1-15. **The Foxboro Company, 2611 Norfolk Street, Foxboro, Massachusetts.**

FOXBORO
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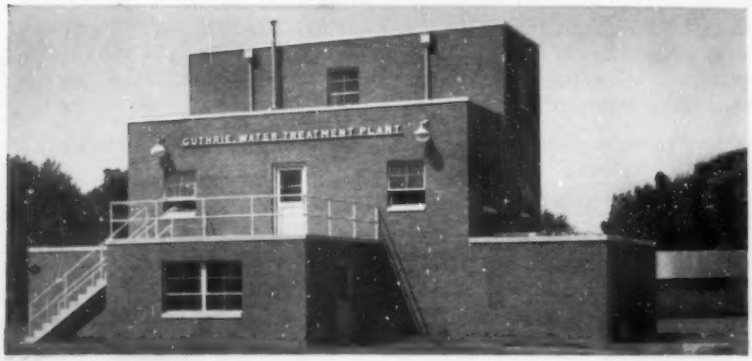
AUTOMATIC CONTROL FOR RAPID SAND FILTERS



Guthrie's modern new water treatment plant has Foxboro instrumentation on each of its Rapid Sand Filters. City manager R. O. Whitchurch says, "We're impressed with the speed of Foxboro control, and with the manual labor it has eliminated for our operators."

In Every Price Bid...
"There is hardly anything in the world that some man cannot make a little worse and sell a little cheaper"
—Ruskin

there's a cost that stays *Sealed* for seven years

All water meters are fine instruments. Any fine instrument loses accuracy as it wears. Because of this fact, written between the lines of any water meter price are two items you can't read for many years. Yet they are vital in choosing the lowest "total price."

First, as a meter loses accuracy, it gives away revenue. Before its first overhaul it may give away twice as much money as it seems to save in its "low bid" original price.

Secondly, to keep the meter accurate you may have higher repair costs over the years . . . or premature scrap-and-replace costs. Good meters often vary widely in this respect.

Tridents are preferred because they earn more and cost less in the long run. They never become obsolete. You modernize your Tridents as you repair. Ask your neighbor . . . or ask Neptune for details.

275

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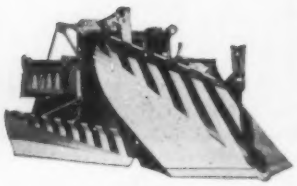
Snow Removal a Problem?

THINK OF...

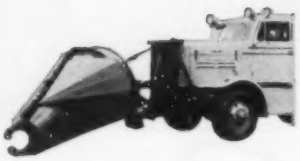
FRINK

Specialists Since 1921 in

SNOW PLOW KNOW-HOW

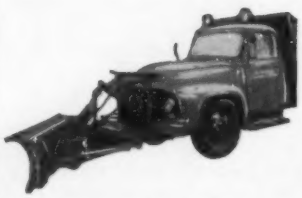


V-TYPE SNO-PLOW
—rugged powerhouse for high-speed, heavy-duty highway work; leveling wings optional.



ROLL-OVER with Taper Blade
—for airports, expressways; rotates left or right in seconds; ends "deadheading."

ONE-WAY with Trip Blade
—for high-speed throwing and spreading, but windrows neatly at city speed.



REVERSIBLE Trip Blade
—all-purpose; plows left, right, bulldozes ahead; power reverse lever in cab.

Since the first steel plow (a Frink) hit the highway 36 years ago, every major advance in snow plow design and performance has been a product of Frink "know-how." Today there are four basic types of Frink Sno-Plows, each with models to fit trucks from 1½ to 12 tons, and most are interchangeable on the same attachment.

Whatever your area's snow removal problem, Frink makes THE plow best equipped to do the job faster, safer and at lower operational cost for plow **and truck.**

Learn all the facts and reasons why so many cities, towns, counties and states specify Frink Sno-Plows. See your distributor or write to Frink for descriptive folders about these plows.

For Snow Plow Know-How
It pays to think of

FRINK SNO-PLOWS

CLAYTON, 1000 Islands, N. Y.
Frink Snow Plows of Canada, Ltd., Toronto, Ontario

Ideal for close quarters . . .

the Le Roi 31 clay spade

Getting into a tight spot with the smooth, well-balanced Le Roi 31 clay spade is a pleasure. It has clean, compact lines for faster digging in cramped quarters — handles easily in any position without tiring the operator. The 31 weighs less than 20 lbs. complete but packs the power of much heavier units. Its one-piece buffer speeds steel changes — keeps dirt out. Other features include precision honing for low air consumption and built-in full-shift lubrication for all moving parts.

Make it a point to see and try the low-cost, high-production 31 at your Le Roi distributor. Or write Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.

AT-715

LE ROI
NEWMATIC
AIR TOOLS

PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

WHY ASPLUNDH IS Your Best Buy IN CHIPPERS!

ASPLUNDH CHIPPERS can cut your hauling costs as much as 75%; will completely eliminate brush burning, and provide a valuable and useful by-product.

Here's how you benefit —

- **positive-locking tapered blades and wedges assure absolute safety**
- **especially designed power unit gives you faster, more uniform chipping action**
- **enlarged feeding area handles bulky brush faster; chips material as large as 6″ in diameter**
- **overall simplicity of design, fewer moving parts lowers maintenance and repair costs**
- **built-in custom tool compartment protects servicing equipment**
- **underslung engine and axle lowers center of gravity, gives superior tracking**

Only ASPLUNDH CHIPPERS have been engineered, developed and *proven* by the largest tree company in the world. *They are safer, faster, more economical to operate than any other chipper made.*

WRITE TODAY FOR COMPLETE INFORMATION. BETTER STILL— ASK FOR A NO-OBLIGATION DEMONSTRATION.

ASPLUNDH CHIPPER COMPANY DEPT. PB
505 York Road, Jenkintown, Pa.

☐ Send me FREE FOLDER: *The Modern Approach to the Brush Problem.*

☐ Arrange a demonstration without obligation.

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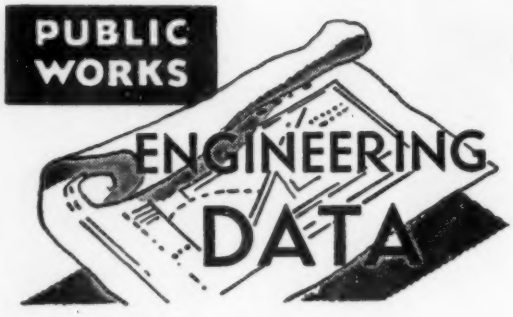
BY ACTUAL TEST THE FASTEST CHIPPER MADE



Automatic Record and Control of Smoke Emission

A firm of British electrical engineers has produced a photo-electric smoke density monitoring equipment. The smoke density monitor is a simple photo-electronic device designed to give reliable indication and recording of smoke emission from a chimney stack. In addition, it can display continuously to the stoker the density of the smoke prevailing in the stack, thus enabling smoke emission to be maintained within statutory limits and helping in the maintenance of a high standard of combustion efficiency.

The apparatus consists of projector, receiver and a control panel, constructed to British Standard 2740/1956; simple smoke alarms; and alarm metering devices. A 6-inch moving coil meter can be supplied to give an indication of the smoke density in the stack; the meter has a continuously shaded scale of increasing density and the switching of the equipment is marked.

The principle of this device is that a visible light beam is projected across the path of the flue-gases and the variation of luminous intensity owing to the gas density is measured by a photo-electric cell. Densities exceeding a pre-set level cause a warning to be sounded and the event recorded.

Sewage Disposal in Unsewered Area

An ordinance passed by Milwaukee, Wisc., in June, 1956, requires all persons wishing to construct dwellings in areas not serviced by a public sanitary sewer to secure a permit for installation of an individual or semipublic sewage disposal system. Soil percolation testing is done to determine suitability of the soil for waste disposal if a soil absorption system is to be provided. If unsatisfactory, no disposal permit or building permit may be granted, thus preventing sewage disposal nuisances. This ordinance was in effect during the year, with 231 permits granted and 26 denied.

Refuse Collection in Albuquerque

The Manager of the Sanitation Department, Albuquerque, N.M., S. B. Robertson reports the number and capacities of refuse collection units as follows: 5 are 12-yard (rear end loaders); 37 are 15-yard (front end loaders); 3 are 16-yard (front end loaders); and 4 are 20-yard (front end loaders). The average weight per cubic yard on our front end loaders is 400 pounds and our rear end loaders 350 pounds. We believe that for our operation the 16-yard capacity body is, in general, the most advantageous.

On a consolidated crew, which consists of two trucks and from 6 to 8 men, the average number

MUELLER®

save time on cuts
2″ through 12″

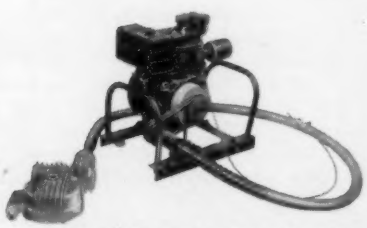
...with the power-driven C-1 Drilling Machine

Making a large cut with the Mueller C-1 Drilling Machine powered by the portable H-602 Gasoline Engine Drive Unit.

The Mueller CC Drilling Machine offers basically the same features as the C-1, but is hand-operated.

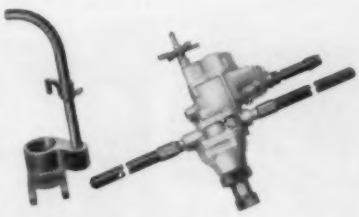
Install inserting valves, connect branch mains and make other cuts through cast iron, steel and asbestos-cement pipe with the power-driven Mueller C-1 Drilling Machine.

Automatic or manual feed gives the operator positive control over the complete 25″ boring bar travel. A feed indicator shows the actual depth of the cut at any time during the drilling operation. Cuts can be made under pressures to 500 p.s.i. at 100° F. or under temperatures to 500° F. at 250 p.s.i.



H-602 Gasoline Engine Drive Unit

Both the H-600 Air Motor and the H-602 Gasoline Engine Drive Units are specifically matched to the C-1 Drilling Machine for maximum performance. The air motor unit will advance the boring bar 1″ in about 8 minutes. The gasoline engine unit is a trifle slower but is more powerful and gives more positive results when making large cuts through steel pipe.



H-600 Air Motor Drive Unit

Compare the many advantages of the power-driven Mueller C-1 Drilling Machine with your present method of making cuts. Ask your Mueller Representative for complete information and costs.

MUELLER CO. 100th YEAR SERVING the Water and Gas Industries QUALITY

Since 1857

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

2 LOW COST DIRT MOVERS with Capacity for Any Job!

Big Yardage ARPS Dozer

The Arps "Dual-Action" dozer can tackle most any dirt moving job, giving your tractor more versatility . . . giving you really big machine performance. Many exclusive features make it an ideal unit for bulldozing, backfilling, grading and leveling. Complete hydraulic control provides powerful, positive down pressure to penetrate even partially frozen soils. Five blade angling adjustments may be made for bulldozing or angle dozing, three adjustments regulate the cutting pitch. Arps dozers are available in 4′, 5′, and 6′ lengths for all popular make tractors . . . are easy to install, effortless to operate.

Versatile ARPS Utility Blade

Even greater tractor usefulness is yours with the Arps Utility Blade, an ideal unit for ditching, terracing, leveling, snow removal, grading, road building and many maintenance jobs. The Arps Utility Blade rotates a full 360°; has a choice of 9 angular positions forward, 3 for reverse; features 8 blade pitch adjustments and 5 tilt positions. Sensational new rake attachment provides even greater versatility for dozens of other jobs.

See your tractor dealer now for complete information on these big capacity Arps dirt movers . . . or write for detailed literature.

Dept. PW

ARPS CORPORATION NEW HOLSTEIN, WIS.

TRENCHERS • HALF-TRACKS

BULL-DOZERS • UTILITY BLADES

of pickups per day is 325 per unit and on the regular 3-man crews, the average number of pickups is 275 to 300 per unit. In Albuquerque 90 percent of the accounts are back door pickups and the average round trip to and from the disposal area is 15 miles.

Twice a week each unit is driven onto a ramp and hosed down with a 1½-in. high pressure fire hose. Although no chemical is used to control odor, the units are sprayed once a week with malathon insecticide.

Laboratory Control for Chicago Water Supply

Chicago has perhaps the best equipped laboratories to be found in any water plant in the world. Over 175,000 tests were run by these laboratories during 1956 in maintaining a close check on the quality of Chicago's water supply both before and after treatment. Routine control is carried on around the clock on all phases of chemical treatment. Bacteriological tests, both by standard and Electron Microscope methods, are made every day of the year. In addition, constant research and investigation into problems in the field of bacteriology, micro-biology, and chemical treatment are being carried on. The most modern laboratory instruments, such as photometers, flame spectrometers, radio-activity monitors and counters, and one of the world's largest magnifying electron microscopes, are used in these investigations. The beginning of fluoridation on May 1st, 1956, greatly increased the number of tests run, as a most careful check is kept on the quality of the fluorine containing chemical, the amount of this material applied to the water, and the quantity of fluorine in the treated water.

Street and Sewer Maintenance in Milwaukee

In 1956, the Bureau of Street and Sewer Maintenance of Milwaukee, Wisc., installed a continuous mix asphalt plant which manufactures a hot mix for use in making temporary repairs on all types of pavements and walks. This plant has reduced the cost of mix by 75 percent and, through proper control, furnishes a better and more uniform product.

Large building construction programs have called for the placing of many miles of temporary pavements annually. Such pavements have posed a serious dust problem in the maintenance field. Until 1956, the only dust palliative used was a light road tar that could be applied only on dry pavements and at proper temperatures. In 1956, sulphite road binder also was used to combat dusty pavements. This program was begun the first week in April and carried on through October. The use of sulphite road binder and oil, when weather conditions permitted, resulted in fewer complaints about dusty pavements.

The sewer maintenance division purchased a trailer chassis-mounted, power operated, sewer rodder for use in removing tree root growth from main sewers. This method of root removal has proven very satisfactory and has reduced the cost of this type of operation by 50 percent.

Better Refuse Collection for Delta

As a first step toward eliminating open refuse containers, the lack of containers and the burning of garbage in yards, an ordinance was passed and made effective in Delta, Colo., as of Jan. 1, 1957. This ordinance established a charge of $1 per month

Adams Filters installed at the new Delaware pool in the Town of Tonawanda, N. Y., give the water extra polish and beauty . . . a special invitation to enjoy the pleasures of this beautiful pool.

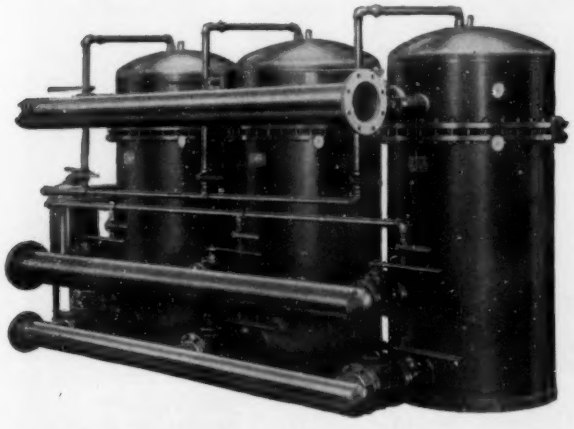
It's easy to keep your pool water Crystal Clear at Lower Costs

Hundreds of swimming pools across the nation have found that Adams filtration packages are the right answer. That's because of the advanced engineering design . . . diatomite filtration . . . permanent Poro-Stone elements . . . compact installation . . . simple operation featuring a new backwash technique.

We have a wide range of filters and delivery is prompt. You'll find the price of crystal clear water for your pool is amazingly low, so write for complete information, today.

ADAMS *SPF*...

TODAY'S FINEST SWIMMING POOL FILTER



Adams SPF filters are ideal for community pools like that illustrated above. This triple SPF 169 can handle pools up to 730,000 gallons capacity.

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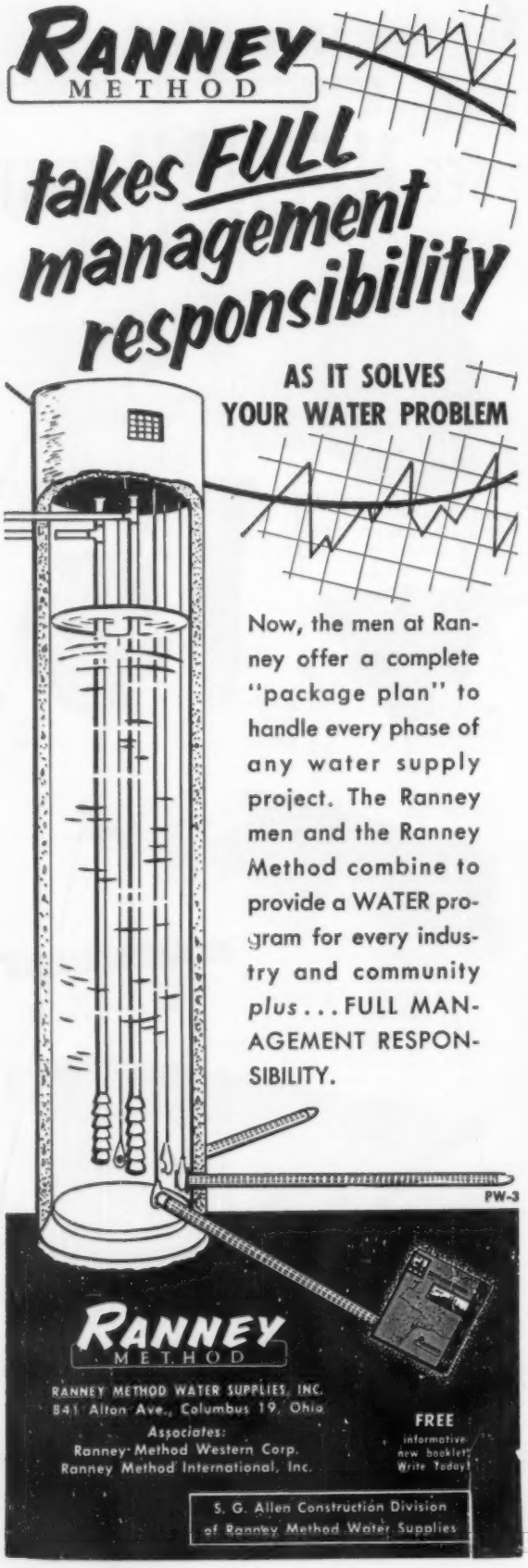
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for residential collection and described specific requirements for size of container (not more than 30 gals.), weight of container (not over 100 pounds filled), placement of containers (in alleys) and method of billing for the service (as a separate item on the electric bill). Charges for commercial collections are based on the time required to collect the material.

One portion of the ordinance covers burning of wastes on the site, specifically prohibiting burning of garbage or any material which "emits objectionable quantities of smoke or obnoxious odors." Burning of leaves is permitted, provided reasonable care is used. Residue from any material burned in private property must be placed in the refuse container.

Two bids were received for contract collection. One of these was for $38,000 per year; the other for $26,000. Since the estimated cost of municipal collection was about $15,000, a 16-yd. packer type body and truck were purchased and put into service in the late summer of 1957. Experience so far has been most satisfactory. Income from the new rates will aggregate about $20,000 per year while operating costs are expected to be materially less.

Riney F. Wilbert is City Manager of Delta.

Municipal Hot Mix Asphalt Plant Reduces Paving Costs

Some ten years ago, Colorado Springs, Colo., acquired a hot mix asphalt plant, part of a $175,000 purchase of construction equipment. In the period 1948 to 1956 inclusive, the city has constructed 1,537,000 sq. yds. of new paving (none of this was built in 1948); and 1,409,000 sq. yds. of resurfacing. A total of 406,000 tons of material was produced. The cost laid, per sq. yd. one inch thick, has varied from a low of 29 cents in 1952 to a high of 38 cents in 1948; for 1955, it was 33 cents and for 1956 32 cents. The average for the nine years is 31 cents.

Last year (1956) was the biggest year for new paving, with 312,910 sq. yds. constructed; also 153,300 sq. yds. of resurfacing were laid. The biggest resurfacing year was 1948 when 744,041 sq. yds. were placed.

Each piece of equipment used is rented to each project on which it is used. In this way a fund is created from which repairs and operating expenses are paid and new equipment is purchased. No specific amounts of funds are budgeted for equipment.

Toll Roads and the Interstate System

Included in the National System of Interstate and Defense Highways are 2100 miles of existing toll roads in 15 states. These inclusions have been recommended by the state highway departments and approved by the Bureau of Public Roads.

Inclusion of the 2,102 miles of toll roads in the Interstate System will not affect their status as toll roads. The Federal-Aid Highway Act of 1956 permits this, although no Federal-Aid funds may be used for their improvement. The Act declared it to be the intent and policy of the Congress to determine whether or not the Federal Government should reimburse the states for toll roads included in the Interstate System. The Bureau of Public Roads has been called upon to report the cost of such reimbursements, by next January, but the Congress will decide if reimbursements are to be made and by what methods and in what amounts.

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Horton® all-welded structures meet the increasing water storage requirements of growing communities by—

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- Providing emergency reserves
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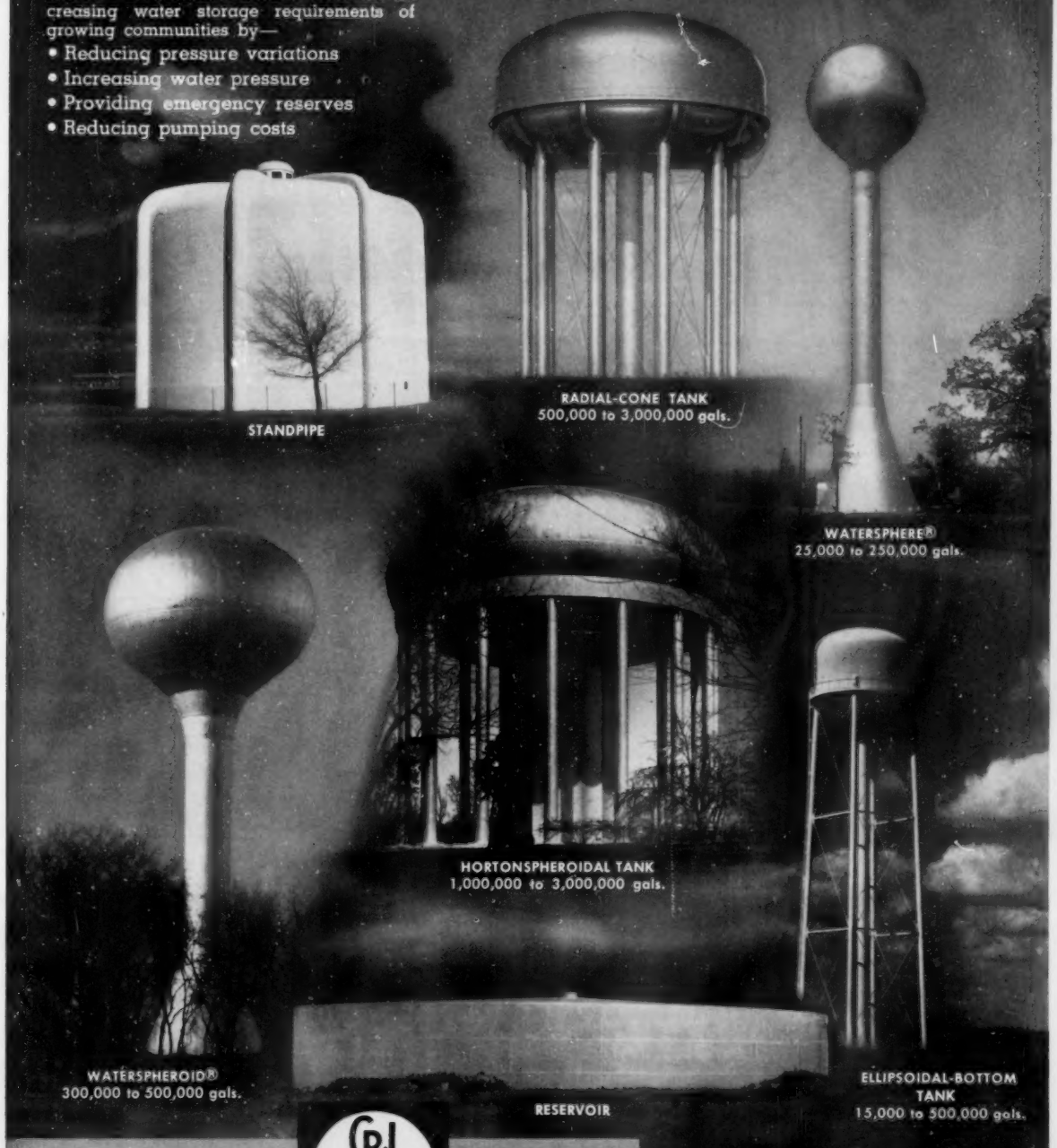

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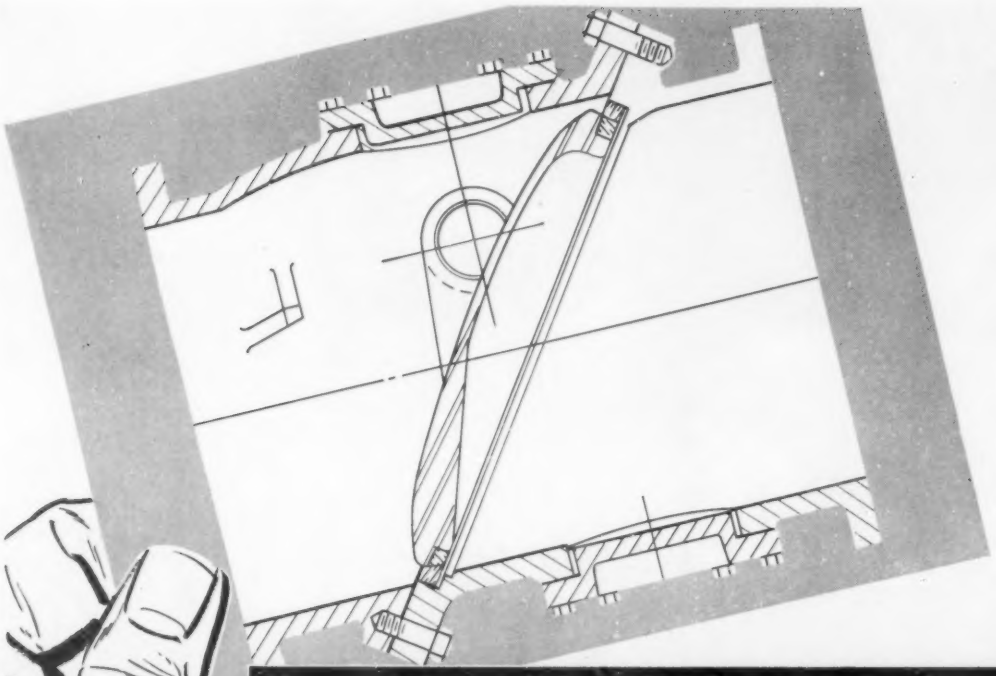

Diagram for quick, quiet, low-cost valve operation

Here's the picture . . . a cross section showing the working principles of the Chapman Tilting Disc Check Valve. It makes sense. It's a clear-cut diagram of a way to save dollars.

Notice the body design — plenty of room allowed to eliminate flow resistance, and the balanced "Airfoil" disc supported on a pivot. When the flow is on, disc opens wide enough to meet the demands of the flow. When the flow is off, disc drops quickly to a firm, tight seat. This is not only quick operation . . . it's quiet operation. There's no flutter. No banging. No slamming. No scraping of disc and seat. All this, of course, means low-cost operation. There's nothing to cause wear and tear or damage to valve or system. Your maintenance costs are low even under severe conditions.

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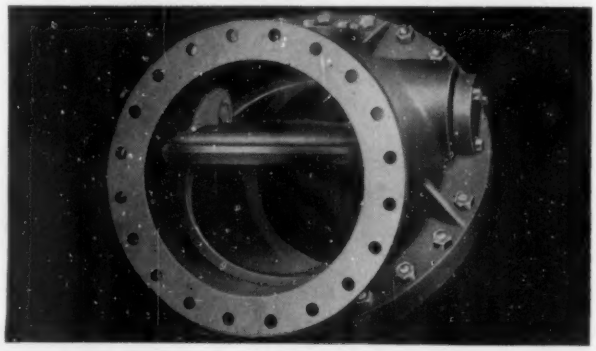

The CHAPMAN
Valve Manufacturing Co.
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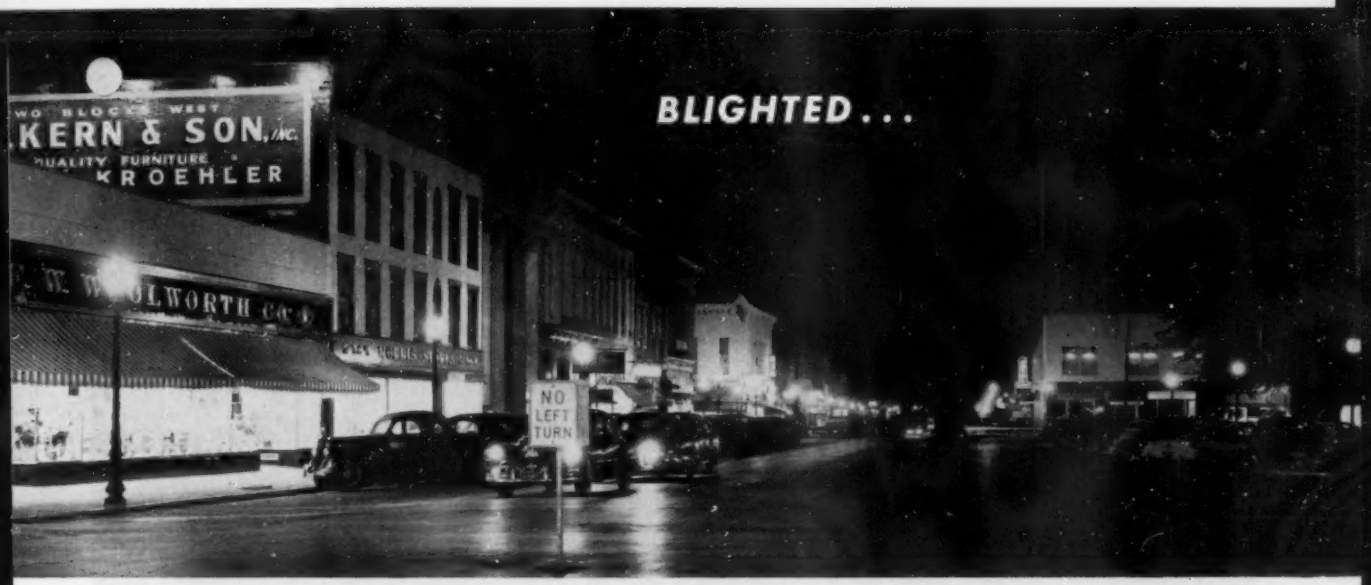


GOOD STREET LIGHTING CAN TRANSFORM a gloomy night shopping area into a safe, busy, cheerful symbol of community progress and prosperity.

Think urban renewal is just for big cities?

No, modernization of the "central city" section is not a problem for only the big metropolises. It's a problem that confronts *every* community which wants to keep its downtown section healthy and thriving.

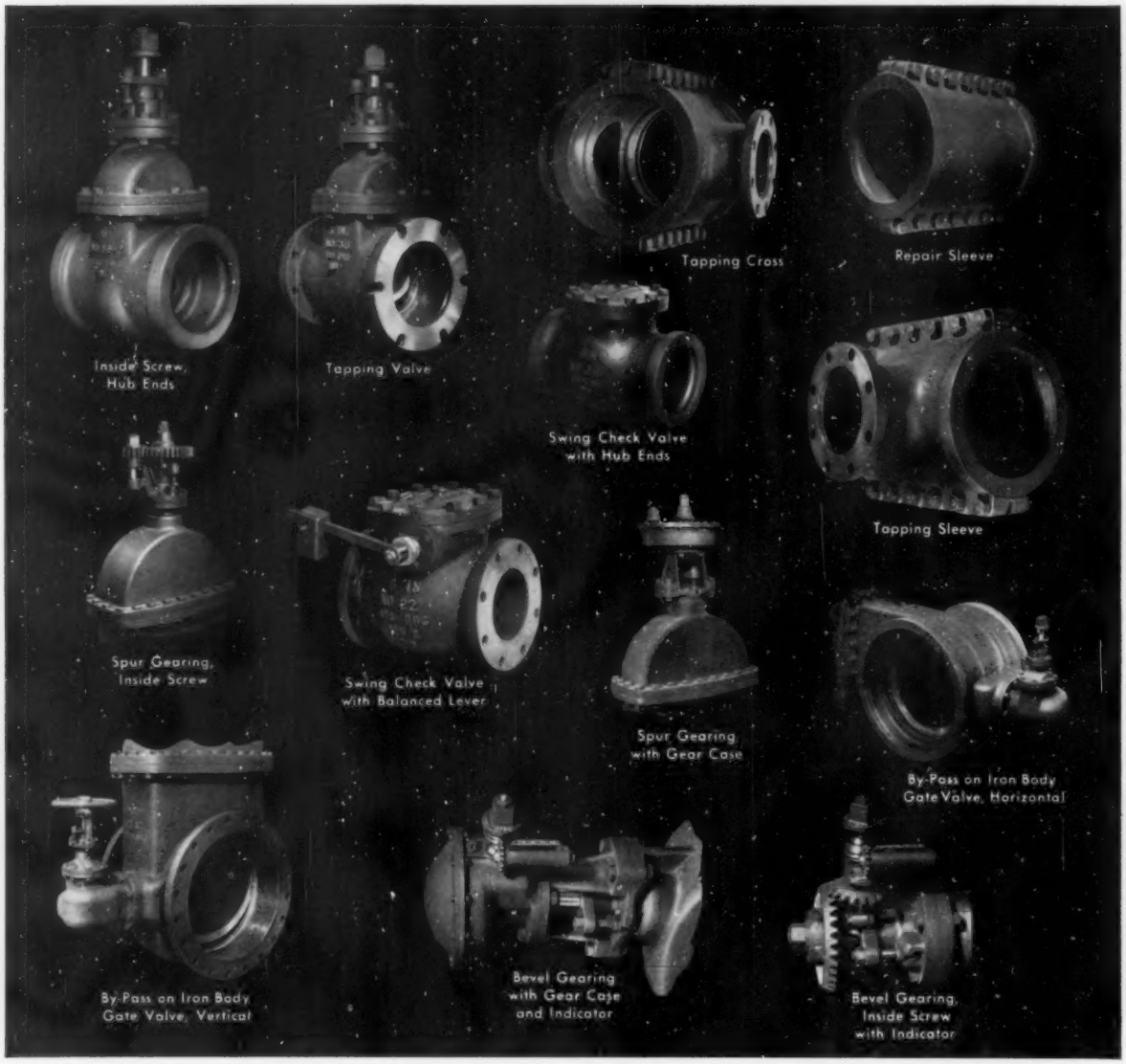
A first step in checking "decay" in your business district is to determine if your public lighting system is up-to-date. For dark, uninviting streets reduce the hours of business, discourage visitors, and spawn accidents, delinquency, and crime.

Trade follows the light. Brightly lighted shopping streets attract out-of-town shoppers, as well as helping hold local customers. Real estate values stabilize, even rise, as the business pace quickens. Community pride and spirit soar as the shadows lift, setting the stage for further civic improvements. Good street lighting is contagious!

See your downtown section in a new light! No other major public works program you could sponsor can be achieved at such low cost, or in such a short time. Begin planning your relighting program—right away—with the help of your electric utility. General Electric Co., Schenectady, N. Y. 455-16

Borrow a print of the movie "Out of Darkness" from your nearest G-E Apparatus Sales Office.

GENERAL ELECTRIC


Inside Screw, Hub Ends
Tapping Valve
Tapping Cross
Repair Sleeve
Swing Check Valve with Hub Ends
Tapping Sleeve
Spur Gearing, Inside Screw
Swing Check Valve with Balanced Lever
Spur Gearing with Gear Case
By-Pass on Iron Body Gate Valve, Horizontal
By-Pass on Iron Body Gate Valve, Vertical
Bevel Gearing with Gear Case and Indicator
Bevel Gearing, Inside Screw with Indicator

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TRADE DARLING MARK

THIS composite picture gives you a rough idea of the broad range of Darling valves and allied products engineered for water distribution systems. What you cannot see here, naturally, is the unexcelled Darling quality—carefully controlled from Darling's own foundry all the way through final assembly and test. Nor can you "picture" performance advantages such as offered only by Darling's fully revolving double disc gate valve principle. For items such as shown here . . . and Darling's revolutionary B-50-B hydrants . . . it will pay you to check with Darling.

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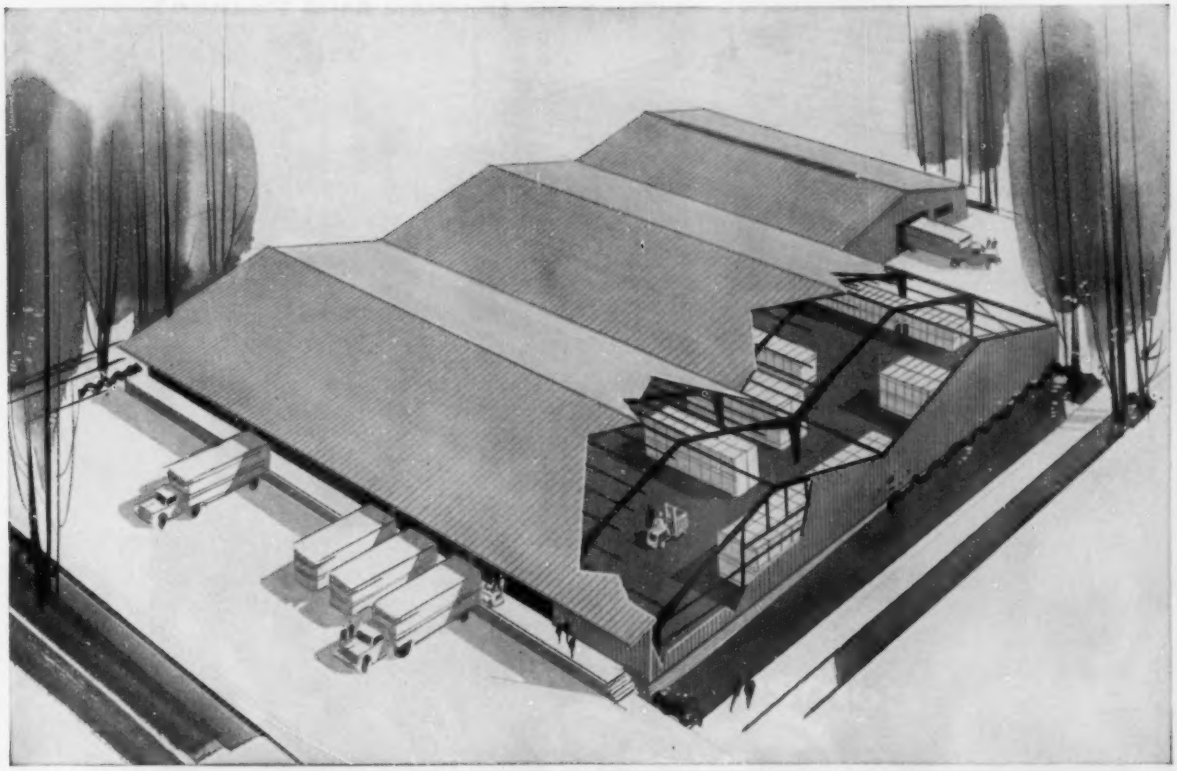

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Hardy Vikings roll in with nine brand-new models, offering new cab-to-rear-axle dimensions for improved semi-trailer, dump, stake and van-type operations. Options available boost GVW ratings all the way to 21,000 lbs.

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This is a sanitary landfill project. It services Glenville and Scotia, N. Y., as well as the Scotia Naval Supply Depot. For the next 4 to 6 years it'll be a refuse disposal operation; after that, kids will be playing on a new ball park here.

Helping make all this possible is the hard-working Caterpillar No. 955 Traxcavator* you see in the picture. The town chose this Cat-built excavator-loader on the recommendation of contractors, on Caterpillar's general reputation, and on its performance in a competitive demonstration. You're interested in recommendations and reputation, too — but performance is the payoff. Let your Caterpillar Dealer demonstrate the No. 955's performance for you.

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See for yourself how versatile this machine is. It's ideal for sanitary landfill work — and it digs and backfills, too. It loads and levels. It stockpiles. It removes snow. It handles dozens of chores easily and economically. Ask your dealer to prove it. He's ready also with expert service and parts you can trust. Call him soon.

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NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

Vol. 88, No. 11 | PUBLIC WORKS MAGAZINE | November 1957

HANDLING THE PROBLEMS of SUBDIVISION HOMES

VICTOR W. SAUER,
Director of Public Works,
Contra Costa County, California

WHAT WAS an undeveloped plot of land last year is, today, a new community. Everything is new: the homes, streets, sign posts, the stubble of adolescent lawns and young untrained shrubs. There are exceptions in some localities, where large walnut trees, stately oaks, and other gifts of Mother Nature, that could be spared in the process of development adorn the streets and yards. But the general tone is freshness and newness; there is little hint of former conditions.

Individuals passing through this recently created neighborhood probably have little knowledge of the planning, coordination of effort, and plain, old-fashioned, hard work by all involved in the solution of problems attendant upon such developments.

A statistical picture of the extent of such growth in Contra Costa County is given by the figures, since 1949, of the number of subdivisions developed—434—and the number of lots in them—17,008.

Population has grown from 100,450 in 1940 to 298,984 in 1950 to 372,528 in 1954; total motor vehicle registrations have increased from 42,801 in 1940 to 151,805 in 1954. In the 8 year period, 1947 to 1954, 123 new industrial plants have been constructed, with 163 enlargements, the total industrial investment amounting to more than $316 million or 54 percent of the County's assessed valuation of more than $613 million.

Many individuals, firms, corporations and governmental agencies are involved in a subdivision development. The landowner, generally through a Real Estate Agent, sells to a developer, who is in the business of building homes which may be in the moderate range to the high-price, luxury home. The developer always needs the services of engineers and, oftentimes, that of his own planner and architect; road and utility contractors, bankers, bondsmen, insurance men, and others. Governmental agencies include, but are not limited to, the Board of Supervisors of the County, the Federal Housing Administration, the Veterans' Administration,

● STANDARDS now in force for subdivisions provide wide and well designed streets and storm water control structures.

● **ENTRY road at Warford Mesa, with Freeway in background. Grade on this entry is the steepest now available.**

Fire Districts, the Flood Control and Water Conservation District, the Planning Commission, the Health Department, Public and Private Utility Companies and Districts, State Highway Division, and the Public Works Department. The complexities of this situation demand State and local control in the form of State Laws and County Ordinances.

Development Backgrounds

In California, three State laws govern subdivisions. (1) The "Conservation and Planning Law" provides that each County *shall* have a Planning Commission and *may* create a Planning Department with a Director of Planning and staff. (2) The "Subdivided Lands Law" defines subdivisions and sets up the office of Real Estate Commissioner. Prior to the time subdivided lands are to be offered for sale or lease, the owner, his agent or subdivider, shall notify the Commissioner of his intention to sell or lease such property. The notice of intention contains certain important basic information on conditions which cannot be altered without first notifying the Real Estate Commissioner. (3) The "Subdivision Map Act" outlines general provisions, matters of administration, scope of regulations; and defines tentative maps, Final Maps and Records of Survey. Matters of certificates and acknowledgements on Final Maps, taxes and assessments, and final approval and record are covered. Contra Costa County's Subdivision Ordinance complies with these basic laws but has added further local regulations patterned to the County's needs in the unincorporated areas.

In 1953 Contra Costa County revised its Subdivision Ordinance to provide higher standards for its rapidly growing number of subdivisions. Geometric improvements of standards included wider streets, curbs and gutters and sidewalks for the smaller size lots. Lots with over 100-ft. frontage do not have mandatory provision for these improvements but many developers of these or wider frontage are voluntarily installing curbs and gutters. (The Subdivision Ordinance is under study again.) Parking lanes of eight feet, and traffic lanes of 10 or 12 feet were used, along with sidewalk width, to determine right of way requirements to handle these fundamental elements of a street. A radical advance in structural design of streets was realized when the California Highway Division's method of design was followed. Subdivision streets thicknesses are determined upon the basis of soil conditions and future traffic loads (Hveem — Stabilometer Method.) Adequate drainage needs, so vital for good streets, are determined by the Contra Costa County Flood Control and Water Conservation District. The subdivider provides monuments which are tied into the California Coordinate Grid System. Water, gas and telephone services are provided by the various utility companies. Sanitary sewers are provided by Sanitary or Sanitation Districts. (The former is a separate political subdivision of the State and the latter is administered by the Board of Supervisors.)

An important administrative procedure, "The Subdivision Conference" was added in the 1953 revision of the Subdivision Ordinance and has met with enthusiastic approval. Prior to the filing of a tentative map, a subdivider may submit to the Planning office plans and other information concerning a proposed or contemplated development. The Planning office shall then, within ten days, schedule a conference with the subdivider on such plans and other data and make such recommendations to the subdivider as shall seem proper regarding them; and shall recommend consultation by the subdivider with other public and private agencies, as may be disclosed by the plans, to be interested. The subdivision conference is an optional procedure which may be elected by the subdivider and is not required by this ordinance; or the subdivider may commence with the filing of a tentative map and may elect to omit the subdivision conference.

In addition to the revised Subdivision Ordinance, the Board of Supervisors has adopted certain policies that have a bearing on many subdivisions. These are:

County Freeway Policy — The County has built 13.08 miles of County freeways or controlled access roads and has 11.07 miles planned for future construction. Driveway connections are not allowed to these freeways: all connections must be street intersections and must come at places designated by the Planning Commission and the Public Works Department, with ultimate approval by the Board of Supervisors. Subdivisions are being built, or planned, around the County's existing and projected Freeway System.

Arterial Streets — In some subdivisions, future adjacent developments will require a multi-lane street improvement through the presently proposed tract. The subdivider must grant the ultimate right of way but is required to construct only the pavement sufficient to serve the traffic created by his development. The County will provide additional pavement when the traffic builds up in the area.

Role of the Public Works Department

The Public Works Department, at the request of the Planning Commission, provides engineering services for the technical staff and the Planning Director of the Commission. To digress, aside from subdivisions, the Sewage, Waste and Water Division of the Public Works Department is preparing a "General Plan for Sewerage" and a "General Plan for Garbage Disposal Sites" for the County. A preliminary report has been developed on the future ultimate needs of the County for agricultural, residential and industrial water needs. These are high-level planning matters and the hearings upon these items are held before the Planning Commission, with final approval by the Board of Supervisors.

Back to subdivisions, we find the Location Division of the Public Works Department providing and coordinating technical assistance from other Divisions of the Public Works Department for the Planning Commission and its staff. Some of these matters are covered in "Processing of Subdivisions."

The Location Engineer (for his position in the Public Works Department organization see PUBLIC WORKS Magazine for February, 1956) also attends all regular and special Planning Commission meetings for the Public Works Director who is an ex-officio member. Ex-officio members are not entitled to vote but may make suggestions or give guidance as requested by Commission members. Additionally, the Location Engineer is the only contact between the Planning Commis-

sion, the Planning Director and his staff, and the Public Works Department in regard to subdivision matters. He is responsible for maintaining proper liaison and controlling communications between these two County Departments. Suggestions from Divisions of the Public Works Department are processed in written form through the Location Engineer. Replies or acknowledgements from the Planning Commission are channeled to the Public Works Division concerned by the Location Engineer. This procedure works smoothly and efficiently, with a minimum of delay and was adopted after other procedures bogged down.

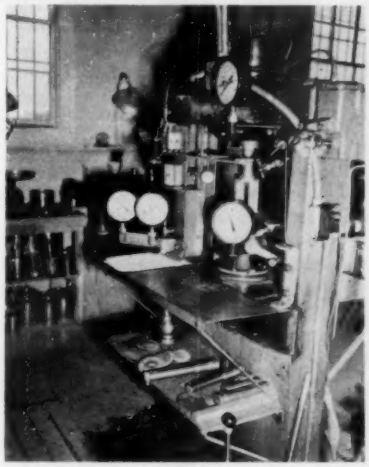
A brief description of some Public Works Department's engineering division functions coordinated in the above manner by the Location Division is given below. The interest in these matters is proper and necessary, since subdivision roads, when built and accepted, become County maintained roads, a responsibility of the Public Works Department.

Traffic Division

It is highly desirable to have a Traffic Engineer or an individual with good training and broad experience in traffic matters to advise and work on traffic design considerations in conjunction with the review of geometric standards for proposed subdivisions. Often additional "safety" can be built into the subdivision by relatively minor adjustments made at this stage and with little or no additional costs.

Traffic Engineers and Planners hold that future subdivision streets are primarily residential in nature and should be treated differently from major thoroughfares. Through traffic should be routed around a subdivision wherever possible. Even so, in Contra Costa County, the average home generates from six to seven trips per day, and in a large subdivision a high volume of traffic is created. Proper layout of entrance and exit streets will do much to keep this volume from building up too high on any one street. However, in some instances one street must carry the major burden of traffic. In this situation curved road alinement with cul-de-sac and minor streets connecting to the high traffic volume street makes a good layout. It is highly desirable to "back up" homes on high volume traffic streets.

In addition to the overall problem of traffic circulation which must accommodate the traffic of tradesmen and deliverymen, school buses, and other vehicles, specific items such as roadway widths and sight distances and the like become highly important.



● **COMPACTOR press with stabilometer is an important tool for the laboratory.**

Both horizontal and vertical sight distances should be sufficient to reduce the element of surprise. In rolling topography a driveway connection near the top of a vertical curve has its hazards and may be a continuing source of bumped fenders particularly for the visitor to the area. Prevention of such difficulties calls for consideration in the planning phase of the subdivision at the time the tentative map is approved and detailed study when the improvement plans are prepared. The other alternative which is generally not economically feasible is the sacrifice of lots to obtain improved sight distances for traffic. Sound and experienced judgment is necessary to obtain an equitable balance in such conditions.

The subdivider provides for the initial installation of street signs throughout the subdivision and the County thereafter provides maintenance and replacement as required. Speed signs, stop signs and other control and regulatory devices are installed by the County if the need arises. All such signing is done on the basis of a Traffic Engineering study.

Street lighting is highly desirable but must be looked at from the point of view of tax equity. The Board of Supervisors has adopted a policy for street lighting which is outlined below. Recommendations to the Board by the Public Works Department are made on a basis of the following criteria:

Safety lighting is paid from the general road maintenance fund, including channelized intersections; intersections where traffic signs are warranted but not yet installed; intersections where three or more night accidents occur per year; and new intersections where it is anticipated that traffic signals will be warranted within five years.

Street lighting is paid for by residents in areas served by Lighting Districts or by County Service Areas.

The increased use of the automobile along with decreased use of sidewalks has sometimes led to insufficient consideration of pedestrians. Sidewalks provide the separate and necessary space for people and children to walk apart from moving traffic. Lack of sidewalks also reduces the distinctiveness of the pedestrian lanes across intersections. In areas where long blocks predominate, pedestrian easements, particularly for school children, are very desirable.

● **PROBLEM of street layouts is complicated by the rugged terrain. Here is a solution of a hillside transition job.**

Materials and Testing

Materials Engineering, which maintains control of the pavement design in regard to bearing capacity of soils, stability against slides and the quality of commerical materials used in road construction, has a major role in insuring safe conservative quality of construction without going to unnecessarily costly pavement design. Our Materials and Testing Division requests the Location Division for soil tests specifying location and number of tests to be made by private engineering firms in the case of subdivisions. These tests with traffic index information enable the Design Division to determine the pavement sections which are processed to the Location Division for distribution to interested parties.

Materials and testing engineering cannot be maintained without competent personnel supplied with a laboratory with sufficient equipment for making the assigned tests. Our laboratory was organized to handle

the $10,250,000 Road Bond Program of a few years ago and has been invaluable in that program and other County road work. Its use in subdivision work is to make requested check or correlation tests.

The work done by the Testing and Materials Laboratory for a typical month represents the work load due to Bond Issue, other capital outlay work and subdivisions. Using state of California rates to local agencies the value of our laboratory work averages about $12,000 per month.

The R-Value Test

The R-value test will be explained briefly since it is the basis of our adopted method of road design for various types of soils and moisture conditions along with wide ranges of traffic loads. In the discussion of the function of the Design Division two typical examples of road design are given.

The R-value to be used is determined after consideration of (a) the Standard "R" value, as determined by the Stabilometer Test, which indicates resistance to plastic deformation, and (b) the "R" value at equilibrium—moisture content.

The Standard "R" value is that resistance shown by a sample compacted at a 400 pounds per square inch exudation pressure, after being exposed to a standard soaking procedure during which the expansion pressure is also measured. The 400 pounds per square inch exudation pressure represents a general condition for soils compacted in the field under current specifications.

An expansive pressure is developed in some soils due to the absorption of moisture. If allowed to expand, the soil loses stability. If the weight of the material in the pavement structure over the soil, or layer of material in question, is sufficient to prevent expansion, the Standard "R" value is used without reduction.

The pressure due to expansion of soils at various moisture contents is determined in the laboratory. If the expansion pressure at standard "R" value exceeds 130 pounds per square foot, the thicknesses of overlay required to counteract expansion are plotted against the corresponding thicknesses required by the "R" values at corresponding moisture contents. The thickness common to both factors ("R" value and expansion pressure) is used. In other words, the soil will absorb moisture until the expansion pressure equals the weight of the overlaying structure with a corresponding reduction in "R" value, and the required thickness is increased because of the reduced "R" value until a point of equilibrium is established.

The use of the proper "R" value along with the Traffic Index for the subdivision gives the thickness of the pavement structure.

Street Design

Two examples of subdivision street design are outlined in the accompanying graphs. Graph I, the Subdivision Traffic Index, was developed by the Traffic Division after a traffic analysis was made of many existing subdivisions and residential areas in Contra Costa County. The number of lots to be served is determined by:

(a) The number of lots on the street itself in case of dead end and cul-de-sac; or

(b) The entire number of lots served beyond a given point for through streets including an estimate of the number

D-8 (2-57)

CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

PAVEMENT DESIGN WORK SHEET

Road Design ☐ Road Name _____ Project No. _____ By R.L.

Sub. Design ☒ Tract Name Rancho Rochas Tract No. 9462 Date 4-8-57

Road Accept. ☐ Road Name _____ Road No. _____

Other ☐ Specify _____

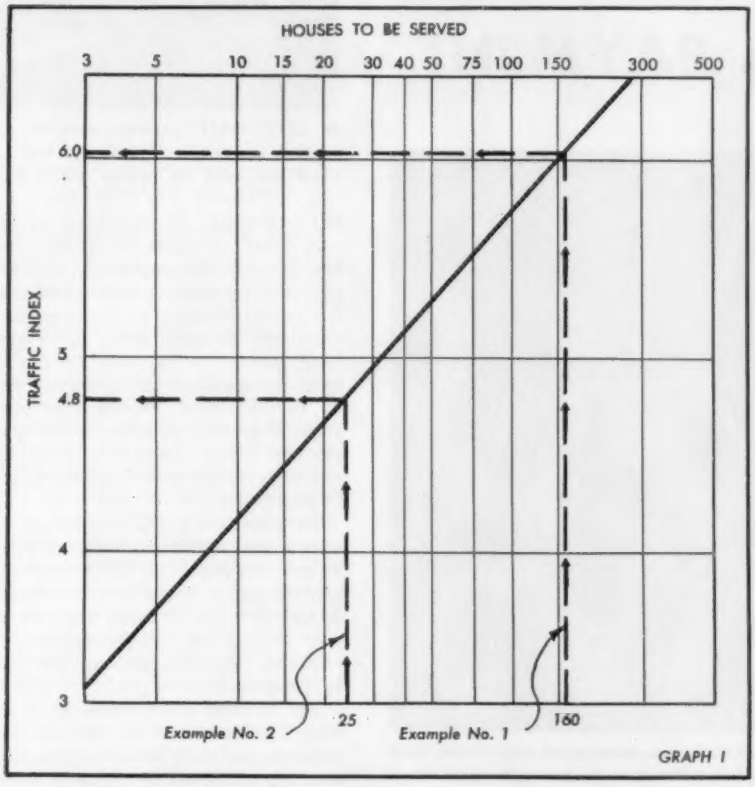
Sect.	From	To	No. Houses	Vac. Lots	T.I.	R	Exp. psf	Thick (R)	Thick (Exp)	T	DESIGN PMS	DESIGN UB	DESIGN SBM	REMARKS
Calle Morena	Hwy.	Tract Bdry.	160		6.0	6	—	17½	—	Adj. 16	1½	6	8½	Example #1
—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — — —
Via Dolor	Calle Morena	Cul de Sac	25		4.8	20	-	11	-	11	1½	6	9½	Example #2
—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — — —
Lab. No. 123				Lab. No. 124										
R	Exp. psf	End. psi		R	Exp.	End.								
4	15	320		7	47	260								Typical test data for use with charts.
6	21	400		18	63	380								
8	40	640		26	84	450								

● **WORK sheet for pavement design showing references to Examples 1 and 2, accompanying charts and descriptive text matter.**

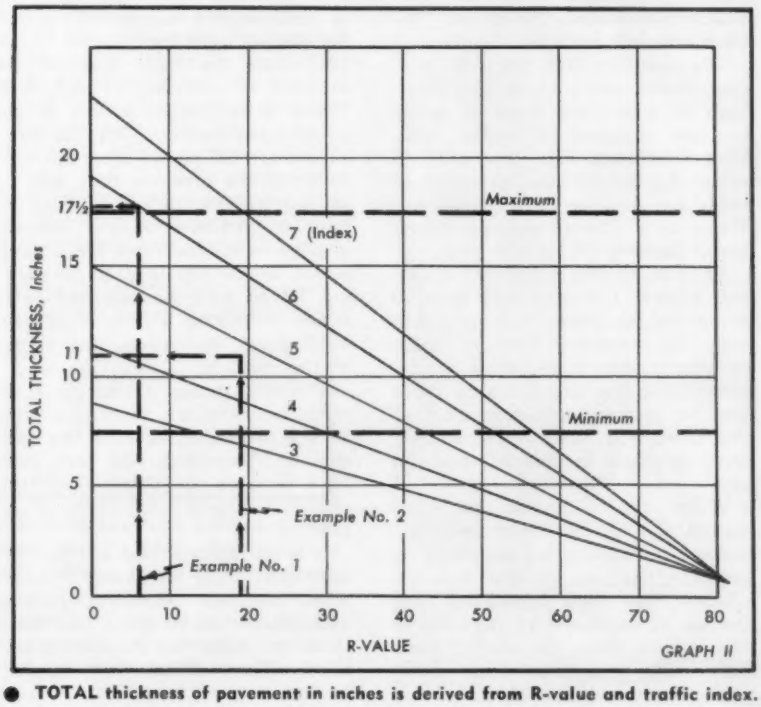
served outside of the subdivision which number is determined by the Planning Commission Staff.

Graph II with the proper "R" value and the Traffic Index gives the total pavement thickness in inches.

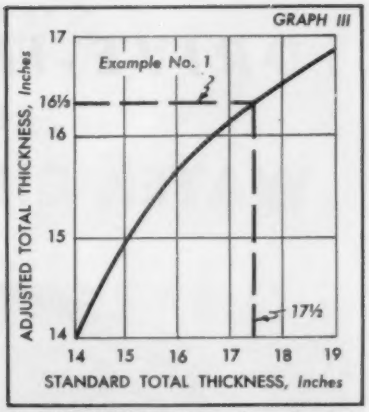
Graph III gives the adjustment in pavement thickness allowed by County practice when Graph II indicates a thickness of 14 or more inches. Except where a major thoroughfare is involved, or other special consideration is required, County practice limits the thickness of subdivision streets to 17 inches as a practical matter. There is an increasing factor of safety against accidental variation in materials and workmanship as the total thickness increases. Also there is the element of high cost if some designs were required to conform to State design criteria throughout.



● **CURVE shows how traffic index is derived from number of houses to be served.**



● **TOTAL thickness of pavement in inches is derived from R-value and traffic index.**



● **PAVEMENT thickness from Graph II is adjusted for local service conditions.**

The minimum design, where soil conditions permit, is 1½-ins. of plant-mixed asphaltic surfacing with a 6-inch untreated rock base conforming to Ordinance 820, The Subdivision Ordinance, making a total thickness of 7½-ins. Additional pavement depth is obtained by using an imported or select job material of "R" value of 45 or more.

The procedure outlined above is to simplify design procedures and does not cover all situations. The establishment of the approved street design is made or approved by the Design Division.

Drainage and Flood Control

The importance of adequate drainage in Contra Costa County's future subdivisions cannot be over emphasized. Purchasers of new homes are entitled to have yards and homes free of water, even in times of heavy storm. The Public Works Department should not have the responsibility of maintaining roads subject to frequent prolonged innundations which increases maintenance costs and accelerates destruction of the roads. In some instances in the past this has happened but not since the Contra Costa County Flood Control and Water Conservation District was formed and staffed a few years ago.

(*Continued on page* 164)

DRIVE-IN SERVICE FOR WATER BILL PAYMENT

● CITY HALL provides drive-in pay window and night depository, both of which are used for paying utility bills.

● DRIVE-IN window at Camden City Hall. About one-third of the utility bills are paid at this window; 9½ percent pay their bills through the night depository.

MAX HOLLAND,

City Manager,

Camden, South Carolina

IN THE August issue of PUBLIC WORKS the question was asked: Where to locate the new office for the Water Department? This article is an account of the experiences of the City of Camden with this problem.

Our city is small, with a business district approximately two blocks square. The Water Department has about 3500 water meters, serving about 15,000 people with its water system.

Several years ago, the City purchased a seven-acre block of property two blocks farther from the business district than the old City Hall, which was located one block from the center of town. Many critics offered the opinion that the new site was too far from the City center. However, plans went forward and ultimately the new City Hall which houses the Utility Department was built on the site.

The new City Hall has a drive-in pay window and a night depository, both of which are used primarily for the payment of utility bills. These facilities also are used to some degree for the payment of taxes and parking meter violations. There is a 115-car employee-customer parking lot on the site.

Prior to moving to the new building, records indicated that over 70 percent of the utility customers paid over the counter. That is, these customers came to the office to pay, notwithstanding the fact that there was no parking available most of the time, and one would usually have to stand in line in order to pay.

When the City Offices were moved, the Utility Department undertook an advertising campaign to promote the use of the drive-in window, the night depository, and the use of the mails for payment of utility bills. Also, the plan of bank drafts was promoted which allows the City to draft on the customer's bank account in payment of his utility bill. In spite of the fact that the promotional campaign included payment by mail, it was noted that, from the old office to the new, mail payments dropped from 25 percent to 21 percent. The number paying over the inside counter (as opposed to the drive-in window) dropped from 70 percent to approximately 33 percent. The number using the drive-in window is approximately 33 percent.

To summarize the percentage of customers paying by each method: 33 percent pay over the counter; 33 percent pay at the drive-in window; 21 percent pay by mail; 9½ percent pay through the night depository; and the other 3½ percent are paid by bank drafts.

The citizens and customers of the City of Camden from all outward appearances have given their wholehearted approval to these new facilities.

It has been our experience that in reducing the number of customers paying over the counter inside the office, we have lessened the number of complaints many-fold. There is no longer a line at the counter and consequently the complaints are not passed from one customer to the other as they step up to the window to pay. When we have a customer at the drive-in window who wishes to file a complaint, we ask him to go to the parking lot to park his car and come inside the office. This is to prevent holding up the cars in line to pay at the window.

The City made a change in its office hours at the time of moving to new offices, eliminating the half-day on Saturdays. So far, there have been no complaints about this change during fifteen months of operation.

It is our opinion that a utility office, away from the center of town, with adequate off-street parking and other "convenience" facilities, is better than the close-in downtown office, without "convenience" facilities.

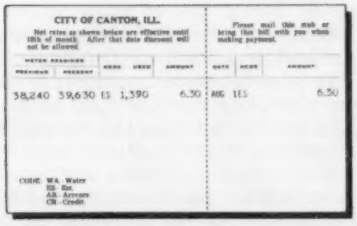
AUTOMATIC ACCOUNTING SLASHES WATER BILLING TIME

CATHERINE EMANS,
Clerk, City Water and Sewer Dept.,
Canton, Ill.

WHEN OUR water billing system began to bog down as a result of population increases and business expansion we found it necessary to revamp the entire operation. By reorganizing and mechanizing our water billing procedure we have saved almost 1,000 hours per year in personnel alone. Besides this significant factor, our modern operation is much faster and more accurate.

The population of Canton began to increase shortly after 1950 and we found our old water billing procedure to be getting too far out of hand. At that time it was all done with ledgers and pencils and was extremely time consuming. It took two people three weeks to complete the monthly billing which is now dispatched by one person in seven to ten days.

With our system of mechanized machine bookkeeping we begin billing on the 12th of each month aided by our Burroughs Sensimatic water billing machine. We have a combined total of approximately 4,000 resident and business water accounts. Meters are read on the 20th and 21st day of each month for business accounts and begin the sixth



CITY OF CANTON, ILL.

Net rates as shown below are effective until 10th of month. After that date discount will not be allowed.

Please mail this stub or bring this bill with you when making payment.

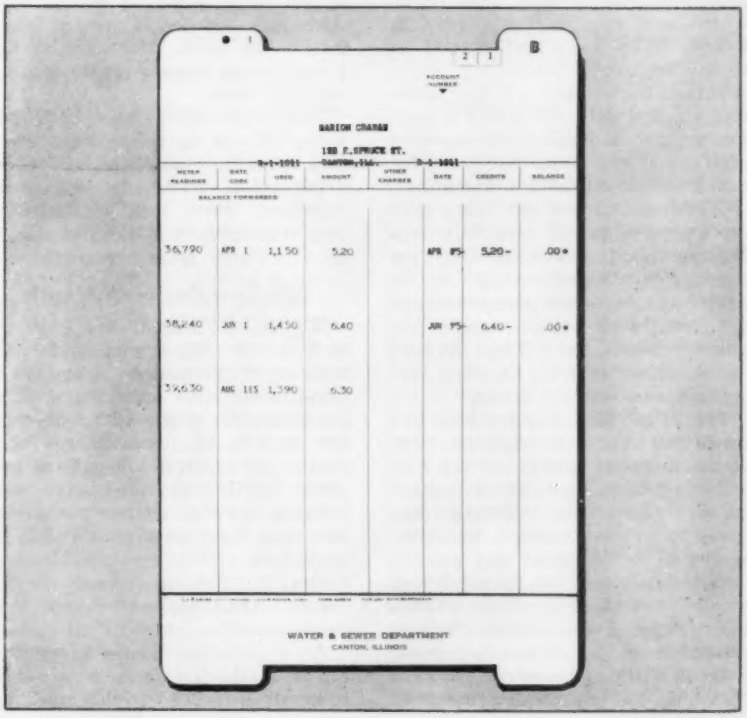
METER READINGS PREVIOUS	PRESENT	CODE	USED	AMOUNT	DATE	CODE	AMOUNT
38,240	39,630	ES	1,390	6.30	AUG	115	6.30

CODE: WA - Water
SE - Sot
AR - Arrears
CR - Credit

● **CARD shows name, address, account number, meter readings, consumption of water, billings, payments and balance.**

● **POST card and ledger are prepared simultaneously. Consumption is computed and the complete record of billings and payments are shown.**

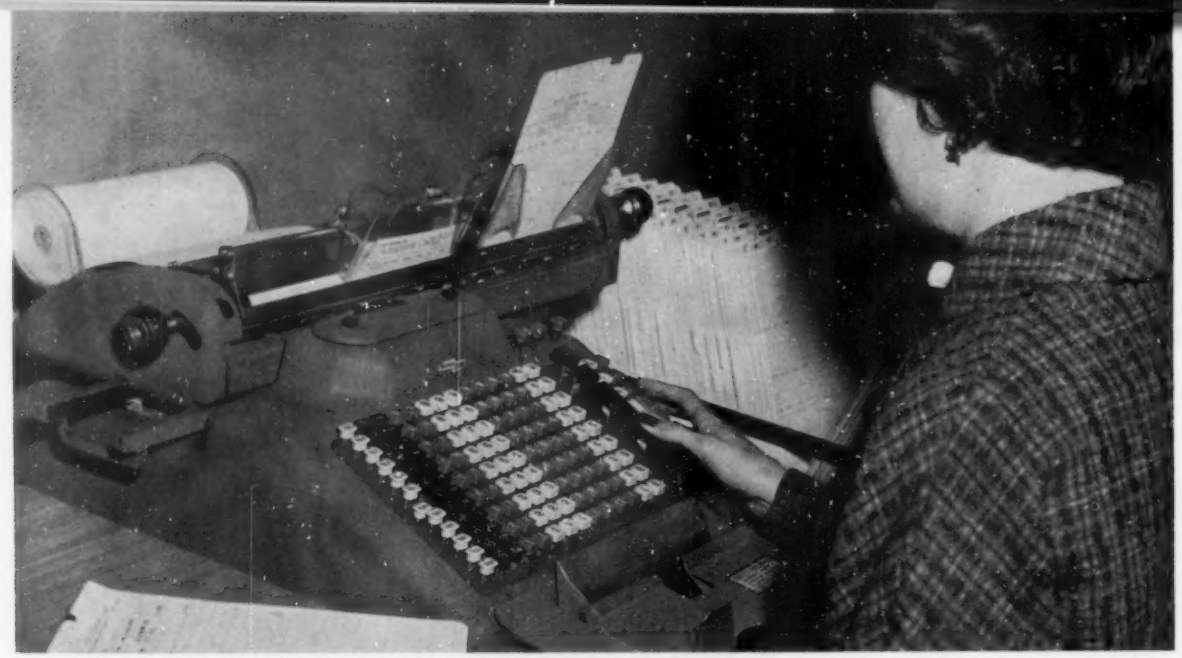
● **EVERYONE is happy over automatic accounting. Miss Emans inserts bill into the receipting machine which receipts it and posts the amount on a locked-in audit tape.**



MARION CRAIAR
188 E. SPRUCE ST.
CANTON, ILL.

METER READINGS	DATE CODE	USED	AMOUNT	OTHER CHARGES	DATE	CREDITS	BALANCE
BALANCE FORWARDED							
36,790	APR 1	1,150	5.20		APR 15	5.20 -	.00
38,240	JUN 1	1,450	6.40		JUN 15	6.40 -	.00
39,630	AUG 115	1,390	6.30				

WATER & SEWER DEPARTMENT
CANTON, ILLINOIS



● POST card water bill and individual ledger sheet are prepared by indexing previous and present readings into machine.

day of every other month for residential accounts.

Consumer's records are arranged by account numbers which are listed from house to house in district areas and are filed in route books for the particular area which the route encompasses. As meters are read they are recorded by the meter reader on a route sheet. The sheets are then turned over to the water billing department for billing.

Three Forms Used In Accounting

For our mechanized system of accounting we use only three forms which are simplified and easy to follow. They have also helped us to minimize our pre-billing work. A simple route sheet, a ledger sheet and a postal card bill which is perforated for a convenient payment stub are all the forms necessary for our streamlined billing operations.

While the meters are being read we have the postal card bills addressographed and filed with the consumer's ledgers ready to be posted as soon as the meter readings are brought in. As we receive the meter amounts, the bill and the ledger sheet are inserted into the machine for automatic dating.

The biller then indexes both the previous and present readings. Both of the amounts appear on the bill, and the present reading is printed on the ledger. The difference between the two readings, the consumption, is computed and printed automatically on both forms. From a rate chart the biller then indexes the amount of the charge. This is printed on the bill, the stub and the ledger. During the operation if a customer has an outstanding balance it is posted to the bill and automatically added to the current amount. If there is no balance from the previous bill, a zero-zero proof appears on a journal that is furnished as a by-product to the billing.

As the billing of each route book is completed the totals of dollar value of the bills, cubic feet used, previous readings and present readings are printed automatically on the journal. To assure overall accuracy and the fact that bills have been prepared for every customer in the route book, an adding machine tape is taken of present readings in the book. The total on the journal must agree with the adding machine total.

With our old system both the water bill and the ledger were separate operations which added to the drudgery of seemingly permanent repetition. Now, both are handled instantaneously and simultaneously by our water billing machine.

Bills Sent Out Each Month

We send bills out near the end of each month. This is a particular advantage of our modern, new system because with the old hand method the bills were delivered by the meter men to each customer. Payments are received or paid at my office. A Burroughs window receipting machine is used to handle this important part of the billing procedure. Bills are payable between the first and tenth of the month. After the tenth there is a small penalty.

As a customer comes in with a bill or mails in a payment, the bill is simply inserted into the machine, receipted and the stub returned to the customer for his record. The amount of the bill is automatically posted to a locked-in audit tape on the machine and added to the total of the other bills which have been receipted. The receiving and receipting of bills is continued throughout the day and the amounts on the audit tape are automatically totaled at the end of each day. Thus, we have a day by day record of where we stand in relation to water billing.

Payment stubs for the day are sent to the billing machine operator together with the total produced by the receipting machine. The biller inserts the customer's ledger in the machine, indexes the amount of the bill and the amount of payment, which is printed on the ledger. If the two figures agree, a zero-zero balance is printed on the ledger. If the payment does not agree with the amount due, the difference is printed on the ledger.

A journal of all postings is provided during the crediting of the ledgers, and a total of all payments received is printed on the journal. This total is checked to agree with the receipting machine total to assure overall balancing and the crediting of payments to all accounts.

Mechanized accounting has more than fulfilled our expectations and in fact has saved us much more time and work than we believed would be possible. Many of the townspeople have commented on the neatness and convenience of our postcard bill. Our work is no longer tedious and tiresome and we have come to regard mechanization as being quite enjoyable.

TECHNICAL TRAINING by CORRESPONDENCE

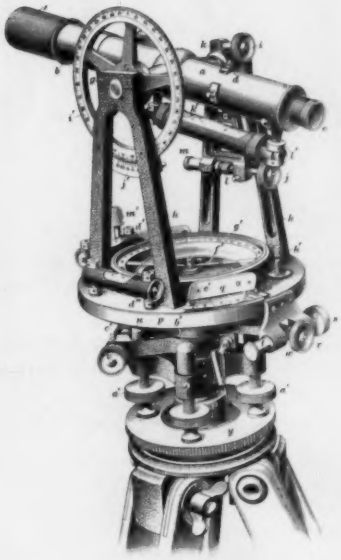
ARCHIBALD DeGROOT,
Director, Civil Engineering School,
International Correspondence Schools

THERE IS ample evidence to show that a person can learn a great deal of engineering by studying a correspondence course. The best evidence is that many men who have had little or no college education and have obtained all their technical training by studying correspondence courses have qualified for licenses as registered professional engineers in the various states. However, the main value of correspondence courses should be to train large numbers of persons needed in the subordinate engineering positions. In this way the correspondence schools can render a real service in combatting the shortage of engineers because the more experienced engineers can then devote their full time to more responsible types of engineering work.

It is not the objective of correspondence schools to compete with resident schools. Men who can go to college should certainly do so. But correspondence schools can supplement the resident schools by providing educational opportunities for persons who for any reason do not find it possible or feasible to attend a resident school. Education by correspondence is available to anyone who desires to study.

The main advantage of correspondence school courses, or home-study courses as they are often called, is that they permit the students to get schooling while remaining in the labor force and earning a living. However, correspondence school courses also have several advantages from the educational standpoint.

One desirable feature is the flexibility of the study program. The person who studies a correspondence course is in a class by himself. He does not have to wait to study a subject until enough other people in a certain locality want the same subject and a classroom and a teacher are available. He can start on any course that is offered at any time and wherever he may be residing. And he can study the subjects in the course in the sequence that is best suited to his individual needs.



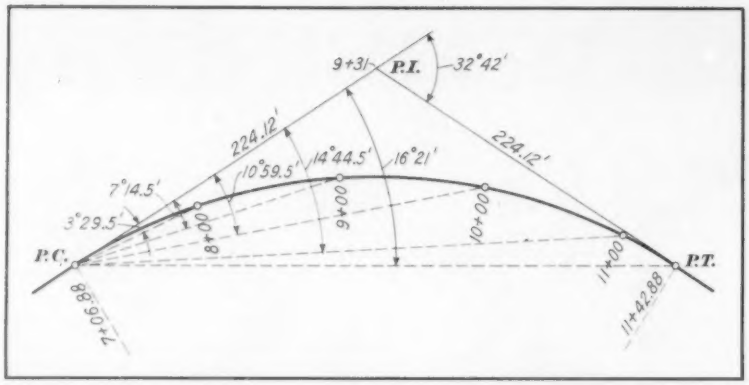
Also, the student taking a correspondence course can proceed at the pace that is most suitable for him. If he devotes several hours a day to study; or if he learns quickly; or if he already has a fairly good knowledge of a subject, he can complete a subject rapidly and go on to the next one immediately. On the other hand, if he has little spare time for study; if he learns slowly; or if he wants to spend more than the usual amount of time on a certain subject because he is specially interested in that subject, he can take all the time he needs to master it thoroughly.

Still another desirable feature of a correspondence course is the fact that the instruction material in the texts is specially suitable for reference. The texts are so written that they can be understood thoroughly by a student who has no classroom teacher available. In other words, the "teacher must be in the text." If a student who is taking a correspondence course misses a study period, he does not lose any instruction. And the student who does not remember all details of a procedure can refer at any time to the text in which the procedure is described and can restudy it.

Finally, the work sent in to the School by a student taking a correspondence course is corrected fully and returned to him with all important errors pointed out and with the necessary corrections and suggestions. The student can keep this work for reference at any future time. It may be said that the examinations prepared by correspondence-school students serve as continued instruction.

Instruction Procedure

The instruction texts used in a correspondence course can be and are prepared to contain all the explanatory material usually needed by the student who has completed the preceding texts in the course. If a student requires more information about a certain part of a text, he writes to the school for an additional explanation. The instruction texts also contain special illustrations, rather than just photographs, to show the construction and operation of equipment. And the student taking a correspondence course usually has access to much equipment on the job. A typical illustration from an ICS text on surveying is reproduced here to show how the construction and operation of the transit are taught. Also, illustrations such as the one shown on page 94 for curve layout are given in texts to clarify the explanations of procedures.



● **ILLUSTRATIONS for use in correspondence texts are prepared carefully and are coordinated with the instruction text to clarify explanations of procedures used.**

Any kind of engineering drafting can be taught by correspondence because the student can get the necessary amount of practice either on the job or at home in a reasonable length of time. In fact, drafting is an outstanding example of a subject that can be taught as well by correspondence as in a resident school.

The basic principles of mathematics that are applied in ordinary engineering work can be taught by correspondence to a person with a normal amount of intelligence. The work of the engineering technician can be taught by correspondence, especially if the student also gets on-the-job training while he is studying. It is possible to teach subjects classed as engineering design, provided they do not involve too much research. Best results are obtained from a correspondence course when the student gets related on-the-job training while he is studying. However, a man who studies by correspondence before he goes to work in the field of his studies can usually make much more rapid progress in practical work than a man who had not studied the subject previously.

About 25,000 students enroll each year for the various engineering and technical courses offered by the International Correspondence Schools. Most of these students are employed before they enroll and take courses that relate to their work and help them prepare for advancement. Usually their employers encourage them to study such courses, and several thousand industrial concerns have set up training programs based on ICS courses. Although their employees enroll voluntarily and as individuals, the various state highway departments have found that the study of ICS courses serves as excellent training for their technical personnel. In one state, for example, forty per cent of the engineers were or are ICS students.

How One Learns

It does not seem necessary to give here a complete description of the learning process when a person studies a correspondence course. A brief outline of the study method should suffice. The correspondence school has prepared the necessary instruction texts to form a course for the person who has no previous knowledge of the subjects covered. These texts are arranged in groups which can be studied by an individual student in the sequence that is best for his particular needs. If a student has obtained a satisfactory knowledge of a subject at a resident school or in practical work, he is not required to study that subject in the correspondence course. Also, if he wants to depart from the standard order of studies so that he can take up as soon as possible a subject he needs in his practical work, he may do so.

When a student completes what may be called an assignment, he is required to prepare a drawing or answers to a set of examination questions, which he mails to the school for criticism and grading. This submitted work is examined very carefully at the school. The examiner does not merely mark each answer right or wrong. The student is shown clearly where he made errors, and he is given additional explanations to help him master the principles which he did not apply correctly in his submitted work. He may also be given suggestions for improving his knowledge or his efficiency, even though his work is correct. The student really gets "individual" instruction on his submitted work. He has the examiner's undivided attention.

Although the student can refer to the texts freely when preparing work to be submitted for correction, nevertheless he is required to understand what he is doing. An engineer engaged in practical work also is permitted to consult reference books freely. He is only expected to know where to find the information he needs and how to use it. This is essential for any engineering practice.

Some examination questions in an assignment of a correspondence course involve the solution of numerical problems. Other questions are of the essay type, but they are so worded that the student is expected to answer them in his own words as much as possible. Objective-type questions, such as multiple-choice and fill-in questions, are not appropriate for correspondence study of engineering, except to a very limited extent.

The person who contemplates taking a correspondence course should realize that he must devote a great deal of time and effort to his studies in order to be able to complete the course satisfactorily. Regular study periods are the key to success, and the student must have the will power to maintain his study schedule in spite of the many temptations to do something else. The rewards of perseverance are well worthwhile. And it would certainly be appropriate to say that the man who takes a correspondence course and studies it conscientiously possesses the characteristics that make for success in his chosen field of endeavor.

The International Correspondence Schools has offices and sales representatives in all parts of the United States to help students enroll for the most suitable courses. Also, there are other schools that offer correspondence courses in special fields. Most of the schools that are in good standing are members of the National Home Study Council with headquarters at 1420 New York Avenue, N.W., Washington 5, D.C. You can get information about courses from the National Home Study Council, from the International Correspondence Schools, Scranton 9, Pennsylvania, or from any other correspondence school that may offer a course in which you are interested.

Believing that correspondence study can do much to mitigate the shortage of engineering and technician personnel, the Editor asked his long time friend, the Author, to prepare this article on how home study is carried on and why it has been such a help to so many.

STAGE CONSTRUCTION KEEPS AKRON AIRPORT RUNWAYS UP TO DATE

CONTINUOUS "STAGE" construction of runways to accommodate steady increases in traffic has proved to be a vital factor in the successful operation of the Akron, Ohio, Municipal Airport over the past 29 years. Factors in the success and economy of the program have been the use of various grades of asphalt emulsions, which are readily adaptable to the stage construction technique. An important advantage has been the virtual elimination of loose material on the runways through the use of an exceptionally high-viscosity emulsion.

Late in 1936, the city sponsored a WPA project for the construction of 178,400 sq. yds. of runway paving. The original runway project called for a 4-in. stabilized soil base with a 1-in. dense graded bituminous surface course and a single seal coat. The local soil was blended in place with a gravel admixture to reduce its 200-mesh content to 20 to 30 percent. Blended soil was stabilized with a mixing grade of Bitumuls emulsified asphalt added at the rate of 4.7 percent by weight of mix. Specifications were worked out with representatives of American Bitumuls & Asphalt Co.

The runways were in continuous use, with a minimum of maintenance, until, during World War II, the Goodyear Aircraft Corp. began building planes for the Navy. Their operations, plus other wartime activities, brought about a substantial increase in the use of the runways. However, through careful planning and by the use of proper construction materials and procedures at the outset of the program, only 1 percent of the base had to be replaced as a result of this traffic increase.

In 1952, plans were prepared for widening and extending a portion of the main runway and constructing a north-south and east-west taxiway together with other minor work. Work on the main runway consisted of a 7-in. thick stabilized soil base course over a 5-in. layer of granular sub-base course and a double seal over a section of old concrete runway. For the taxiways, a 3-1/2-in. stabilized soil base course, 50 ft. wide, was provided with the intention of later converting the north-south taxiway into a runway by adding another 3-1/2-in. layer of stabilized base on top, then widening 150 ft.

A single seal coat was applied over the taxiways, totalling approximately 18,000 sq. yds. Balance of the work included over 70,000 sq. yds. of grading over 1,000 lin. ft. of 15-inch storm drainage, and a small extension of the lighting system.

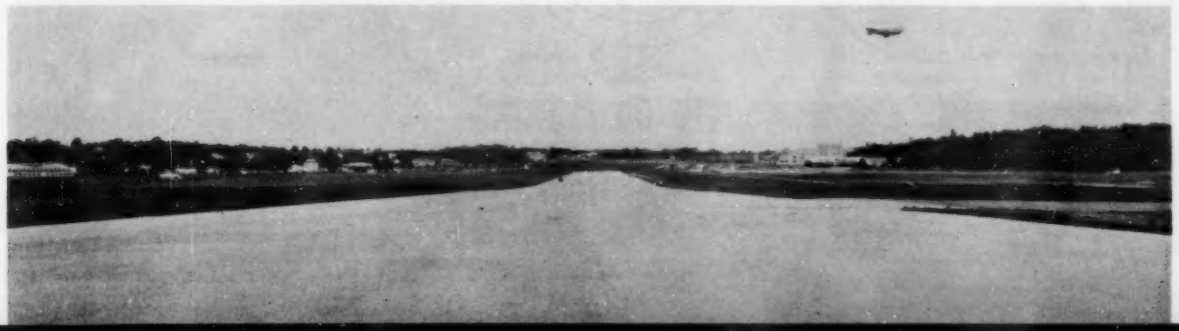
Engineers decided in 1956 that the northeast — southwest runway, which has a total length of 5,440 ft. and a width of 150 ft., should be further improved and strengthened by placing a penetration macadam on the existing surface and adjusting the crown on the basis of 1-1/2 percent slope. It was determined that the macadam would have a depth at the center of 8 to 11 inches in some cases, tapering off at the sides to the old grade. This was built up in lifts not exceeding 4 inches. Areas requiring a thickness greater than 4-in. were constructed in lifts to the proper cross section. Each course was penetrated with an application of Bitumuls RS-1 emulsified asphalt.

An important factor contributing to the overall efficiency of the job was the use of a vibrating roller in addition to the usual three-wheel and tandem rollers. With the use of an exceptionally high viscosity Bitumuls sealing emulsion and the vibrating roller, the aggregate was embedded so well that loose material on the surface was practically eliminated.

Total area resurfaced equalled 99,760 sq. yds. using 19,070 tons of slag; 454,900 gallons of prime coat plus penetration-grade emulsified asphalt; and 34,500 gallons of high viscosity Bitumuls emulsified asphalt for sealing work.

Designs for the Akron Airport runway construction projects were furnished by the Engineering Department of the City of Akron and approved by the CAA. Inspection was handled by the H. C. Nutting Co., Cincinnati, Ohio.

● **FINISHED taxiway at Akron airport as developed through continuous stage construction using emulsified asphalt.**



SEWAGE TREATMENT for a

FRANK R. BURDE, PE,
Sanitary Engineer,
Dravo Corporation, New York City

Treatment plant design data from Weston, Eckenfelder & Associates

GARDEN STATE PLAZA is a multi-million dollar shopping center located across the Hudson River from New York, in Paramus, N. J., at the intersection of Routes 4 and 17. It is the first major shopping center constructed in an unsewered area. Provision for adequate sewage treatment had to be made on the basis of comparative analyses of water consumption; square feet of floor area; number and type of toilet facilities and wash rooms; and restaurant type and seating capacity as assembled from other shopping centers. This was very high-priced land, so disposal had to be accomplished on a limited area. The actual area required for the plant was only 75 ft. by 65 ft.

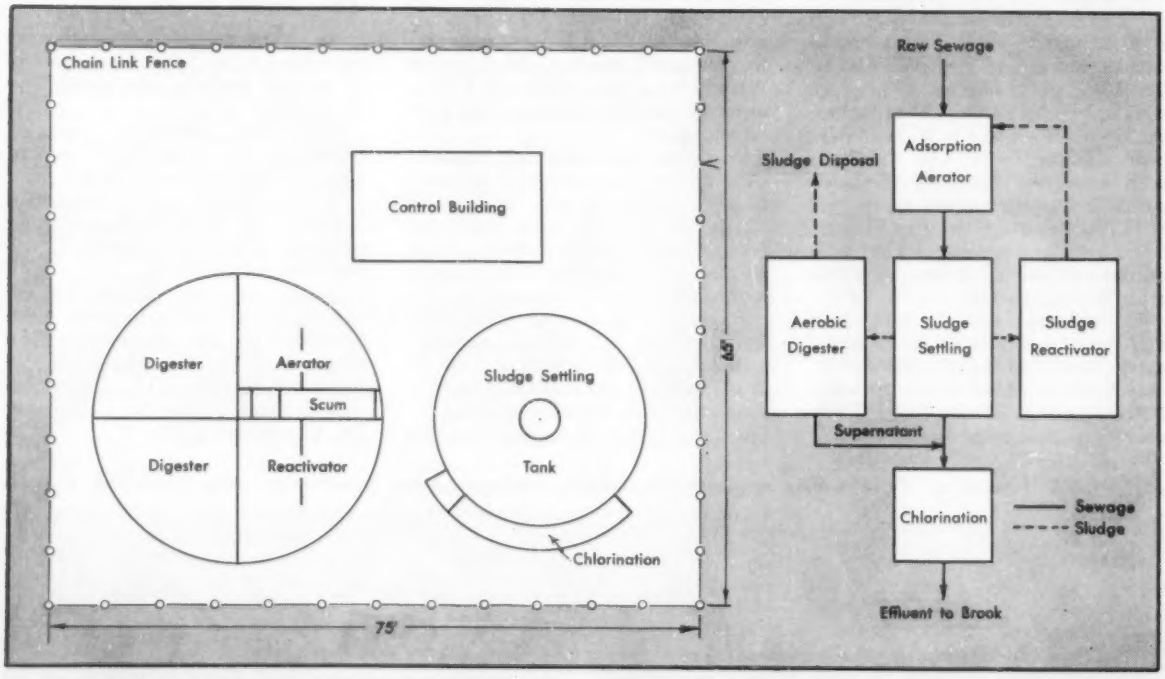
The Garden State Plaza has a land area of 140 acres which will allow construction of a shopping center with a potential of 1.5 million square feet of rentable space and parking provision for about 11,500 cars. The first group of stores cover some 800,000 sq. ft.; the second group now under construction will provide an additional 250,000 sq. ft. Total employment will be about 1400.

The area is unsewered. Abbott-Merkt, the Architect-Engineer, made a series of studies to determine the best solution for the disposal of the sewage from the center. An inquiry regarding the possibility of discharge into the trunk sewer of the Passaic Valley Sewer Commission received a "not feasible" reply. The nearby Rochelle Park sewage treatment plant, already overloaded, was considered in regard to the possibility of enlargement, but discharge into this system and treatment at this plant proved unworkable. The Bergen County Sewer Authority advised that a trunk line serving the Maywood-Rochelle Park-Paramus area was probably five years in the future. It appeared that Garden State Plaza would have to provide its own facilities.

In addition to assembling such information as was available from other shopping centers, a 24-hour survey was conducted on the flow rate and sewage characteristics of the Westchester County (N. Y.) shopping center. On the basis of this study, and giving consideration to the fact that ground water at Garden State Plaza was relatively near the surface, design data were adopted as follows: Average 8-hour flow rate 165 gpm; maximum hourly flow rate 315 gpm; BOD 360 ppm; suspended solids 163 ppm; volatile suspended solids 152 ppm; pH 6.9.

It was felt that the sewage characteristics of restaurant and sanitary facilities at the shopping center would be similar to those at Turnpike service areas. The Westchester study confirmed this and established the design data given above.

Sprout Brook flows alongside the shopping center. It is a small stream of nominal flow during the dry summer months. Upstream the brook is used for irrigation by a number of truck farms and as the receiving stream for the treated sewage from a County hospital. Below the Center the brook is used only for drainage prior to discharging into the Saddle River which flows through a County Park and recreation area. As a result of the limited flow and ultimate stream usage, the New Jersey State Health Department required



● **PLAN of the compact sewage treatment plant and, at right, flow sheet of the Biological Coagulation Process.**

MODERN SHOPPING CENTER

Photo by Fairchild Aerial Surveys, Inc.

● **BUSY HIGHWAYS brought the Garden State Plaza to this location, despite lack of municipal sewerage facilities.**

complete treatment and chlorination.

With the above factors established, the Abbott-Merkt study was now resolved into finding: (1) A design that would yield the required performance without nuisance; (2) a process with limited operational problems; (3) a plant economical enough to be constructed on a limited budget; and (4) a plant requiring a limited amount of very valuable land area.

Investigations by John Hood and W. W. Eckenfelder[1] indicated that the Ridgewood Biological Coagulation Process satisfied these four requirements. Suspended solids and 5-day BOD could be reduced by more than 90 percent; foaming would not be a problem; with a basic understanding of the fundamentals, an operator could maintain process values under a wide range of loading conditions; and total tank capacity could be reduced to less than one-half of conventionally designed plants with proportional capital savings. The merits of the process were further confirmed by experience and operating data from Austin, Texas.[2]

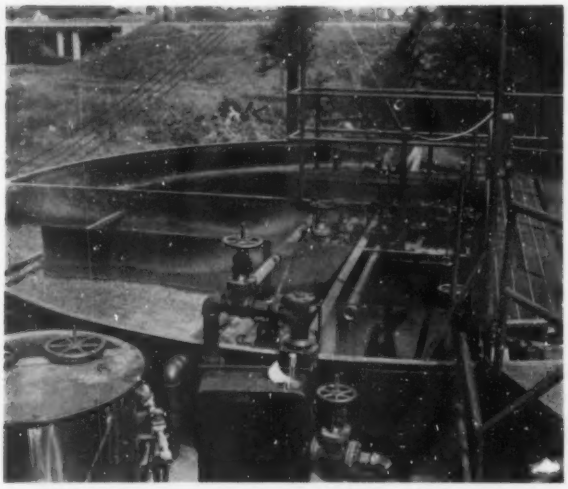
Since this process met all of Abbott-Merkt's requirements, a contract was awarded to Dravo Corporation to furnish and erect a sewage treatment plant utilizing the Biological Coagulation Process and aerobic digestion.

The shopping center's sewage treatment plant as constructed consists of two compartmented steel tanks placed on concrete pads at ground level and a cement block control building. One tank is subdivided into the adsorption aerator; the return sludge reactivator; two aerobic digesters; and scum sump and drainage sump. The other tank provides sludge settling with surface skimming; chlorination; flow metering and return sludge sump with air lift pump. The control building contains the two air blowers, chlorinator and laboratory equipment.

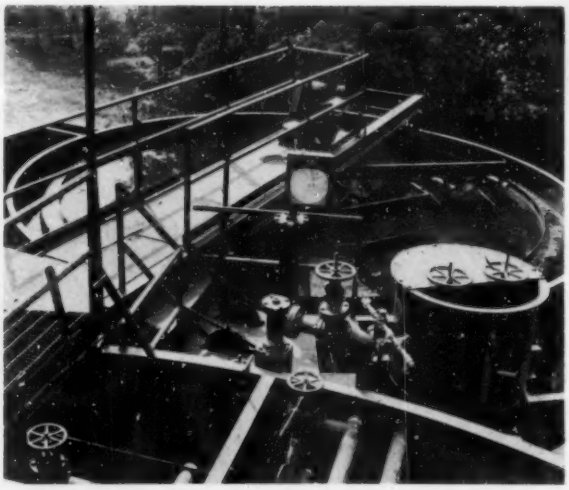
Description of Flow

The raw sewage is comminuted prior to discharging into the wet well from which it is pumped under liquid level control to the inlet channel of the adsorption aerator. Here it mixes with the reactivated return sludge; the mixed liquor (3000 ppm sludge solids) flows to the aerator for at least 20 minutes aeration. Biological coagulation occurs in a manner analogous to chemical coagulation; the clarified liquor and the biological coagulant with its adsorbed organics separate in the settling tank. The clarified liquor is chlorinated and discharged into Sprout Brook; scum and floatable material is skimmed into a scum drop box and drains to the scum sump; the settled sludge is scraped to a center concentrating sump from which it is air lifted to a division box. From the division box the sludge flows to the sludge reactivator; excess sludge can be diverted to one of the two aerobic digester compartments. The return sludge is aerated about 90 minutes in the reactivation tank prior to reuse by mixing with the raw sewage in the inlet channel.

About 2000 gallons per day of excess sludge of one percent solids is aerated in the digester compartment for about six days resulting in a stable, readily dewatered sludge.



● **COMPARTMENTED aeration tank was used in the Garden State Plaza plant. Steel was utilized for most structures.**



● **COMPACTNESS was a consideration. Here is final settling tank, chlorination and return sludge air lift pump.**

Periodically the digester air is shut off to permit liquid-solids separation; the supernatant clarified liquor is decanted by a swing drawoff and additional digester capacity is thus made available. Provision is made for at least 28 days' storage of aerobically digested sludge of 1.6 percent total solids concentration. Since the plant is located adjacent to the shopping center, a drive-in theater and a residential area, the digested sludge is removed by scavenger for off-site disposal.

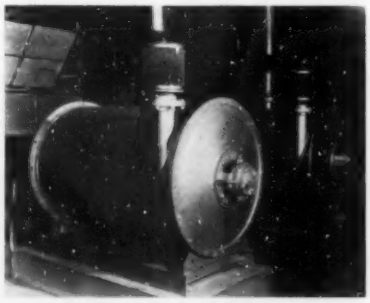
Architect-Engineer for the shopping center was Abbott-Merkt & Co., Inc. Sewage plant design Engineer was Weston, Eckenfelder & Associates; Hazen & Sawyer designed the pumping station; and Dravo Corp. was general contractor. The comminutor was furnished by Worthington; the sewage pumps by American Well Works; the aerators, settling tank equipment, skimmers and air lift pump by Walker Process; the blowers by Spencer Turbine; the submersible pump by Weil; and the chlorinator and flow meter by Fischer & Porter.

Detail Design Data

The sewage treatment plant is designed on the basis of an 8-hour average flow of 237,500 gpd and a maximum hourly flow rate of 455,000 gpd. The adsorption aerator has a capacity of 1350 cu. ft. and a contact time of 38 minutes for the 8-hour average flow plus return sludge flow of 142,500 gpd. For maximum hourly flows, with 273,000 gpd return sludge, the contact time is 20 minutes.

The sedimentation tank has an overflow rate of 670 gpd per sq. ft. at 8-hour average flow and 1320 gpdsf for the maximum hour; retention periods are 138 minutes and 72 minutes. The sludge reactivator has a capacity of 2290 cu. ft. and a contact time of 172 minutes for 8-hr. average flow and 90 minutes for the maximum hour. The aerobic digesters, two in number, 3,000 cu. ft. each, are designed for a sludge production of 190 lbs. per day, a sludge volume of 2280 gpd, a digestion time of 6 days and a storage time of 28 days. There are two 20-hp air blowers of 250 cfm capacity each. Air requirements are: Aerator plus reactivator 135 cfm; aerobic digestors 60 cfm; and air lift 55 cfm. Per gallon of sewage to the aerator and reactivator, 0.82 cf of air is provided for the 8-hr. average flow and 0.43 cf for the maximum hour. The mixed liquor in the aerator is designed to carry 3,000 ppm suspended solids; the return sludge concentration from the sedimentation tank is held at 8,000 ppm.

Operating results for July, 1957, indicate an average 8-hr. flow of 115 gpm, with a minimum of 28 gpm and a maximum of 382 gpm. Maximum BOD of the raw sewage was slightly above 400 ppm, with a daily average of about 130 ppm. At week-ends BOD of the raw sewage dropped to 20 ppm or less. The effluent during July did not exceed 7 or 8 ppm BOD and was usually at 5 ppm or below.



● **CENTRIFUGAL blowers, inside the control building, provide for air needs. There are two blowers of 250 cfm each.**

References

1. Hood, John W. and Spoohr, Gunther W., "Studies Promote Better Understanding of the Activated Sludge Process." Public Works, January, 1957.
2. Ullrich, A. H., "Experiences at Austin, Texas—A New Development in Activated Sludge." Water and Sewage Works, January, 1957.

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Beware the Fragrance of Pig Raising

Complaints about piggeries in Secaucus, N. J., increased as new highways through the area made the odors noticeable to increasing numbers of persons. What had once been a relatively remote area in the Hackensack meadows became encroached upon as a result of the pressures of civilization. One of the consequences has been a ruling by the courts that pig raising in Secaucus must cease by late 1958. Possibly these pig raisers may go elsewhere in New Jersey. If they do find places, the town fathers of those municipalities would be well advised to establish minimum standards for maintenance and operation or they, too, may find that as the area grows, there will be irritation and annoyance with a malodorous condition.—From a talk by Dr. Daniel Bergsma, N. J. State Health Officer.

REFUSE COMPOSTING in INDIA

JOHN M. HENDERSON,
Sanitary Engineer,
Savannah, Georgia

DURING THE course of the writer's tour of India early in 1957 on behalf of the International Cooperation Administration and the Government of India for the purpose of evaluating the national malaria control program, a visit was made to the City of Indore. This city is the birthplace of the Indore composting process, developed by Sir Albert Howard about 30 years ago. Due to current interest in the United States in the composting of solid wastes, and because of the historical significance of composting processes developed in India, brief description is given of current composting practices in Indore.

Indore (population about 300,000), has four sites for the composting of mixed municipal refuse and night soil. In spite of the fact that the Indore process originated there, this process is used at only one small site, the Bangalore process being used at the other three larger sites.

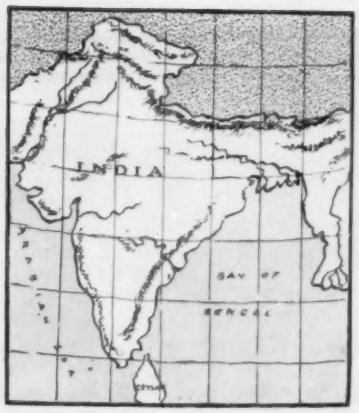
There are three separate systems of collection of household refuse. Vehicles are used to collect sullage water (kitchen and bath water) from a limited number of premises by pumping or bailing the liquid from underground storage into tanks on the vehicles. This liquid waste does not play any significant role in the local composting processes, although it can provide a source of supplementary water at the composting sites when the solid compostable wastes are too dry. Other vehicles are used for the collection of night soil from residential and business premises, while a third group is used to collect street sweepings and domestic refuse, including garbage. The night soil, composed of urine and feces, is excessively wet, while the refuse is not only drier than American municipal refuse due to lack of fresh fruit and vegetable wastes, but the per capita yield is extremely low. There is no sorting problem. Tin cans are almost nil and any materials possessing any salvage value do not show up in the refuse as delivered to the composting sites. Essentially cellulosic in nature, the refuse with its high carbon, negligible nitrogen and low moisture content is balanced by the night soil with its high nitrogen values and high moisture content.

Indore Process

The basic structure used in the Indore process is a shallow open masonry pit 2 to 3 feet deep, 10 to 12 feet wide, and about 100 feet long. Night soil and mixed street sweepings and domestic refuse are placed in the pit in alternate layers each about 3 inches thick, to a depth of up to 5 feet. This material is placed along the length of the pit but in only half the width in order to permit subsequent turning. Daily loadings in the pit are marked by small dated stakes. When the pit is filled its entire length, another pit is used. At the time the site was visited, the street sweepings contained an excess of leaves, some of which were being burned.

● **INDORE process utilizes an open masonry pit 2 to 3 ft. deep, 10 or 12 ft. wide and up to 100 feet in length.**

● **BANGALORE process uses series of open trenches about 4 ft. deep; material is built above ground level and covered.**



The material contains house fly eggs and adult flies on arrival at the disposal site. The fly problem at this stage is effectively controlled by a single application of a 2.5 percent solution of benzene hexachloride containing 6.25 percent gamma isomer in the technical grade material. Application is at the rate of 1 Imperial gallon per thousand square feet. Resistance has not developed apparently because of the general lack of use of insecticides at points other than the disposal site and because the problem is one of controlling populations imported daily from these other points. Thereafter, composting action takes care of the fly problem.

The compost is turned in the pit every 15 days for 2 months, then stored on the ground beside the pit for another month without turning. The composting action is mixed aerobic-anaerobic, with aerobic action predominating following each turning. Including placement in the pit and final removal, the Indore process requires six complete handlings of the compost by manual labor.

Bangalore Process

The first step in the Bangalore process is the construction of a series of earth trenches, each 30 feet long, and originally 4 feet wide and 4 feet deep. The fresh material is placed in layers as in the Indore Process to a height about 18 inches above ground level, then eventually covered with a 6-inch layer of earth. The material is not turned and digestion under essentially anaerobic conditions is completed in 4 to 5 months. Fly control is achieved by the earth cover and possibly heat of decomposition. Only two handlings are involved. The earth trenches are reused many times with gradual loss of cross section.

(*Continued on page* 176)

WORN-OUT ROAD
Rebuilt With
LIME STABILIZATION

ONE OF the latest municipalities to experiment with lime stabilization for reconstructing worn streets is the Village of Fox Point, Wisconsin, a residential community of 6500 population located north of Milwaukee along Lake Michigan. This first job, carried out in July, involved a worn-out surface treated gravel road in which excess clay in the base course had contributed to failure. The construction procedure was simple, consisting of spreading bank run gravel where needed; scarifying the road bed to a depth of 6 in.; applying hydrated lime; mixing and pulverizing; compacting with sheep's foot and rubber-tired rollers; and, after a 4-day curing period, applying a pea gravel seal coat. The work was performed by the Fox Point maintenance crew under the supervision of W. J. Blong, Village Manager and Commissioner of Public Works.

In this type of road construction, hydrated lime performs several important functions. First it reacts chemically with the clay particles, agglomerating them into coarser, more friable material; this facilitates mixing and blading operations. Lime also effects a sharp reduction in the plasticity index of soil aggregate mixtures, in some cases rendering them non-plastic. Then, under proper compaction and curing, lime reacts pozzolanically with the clay particles, cementing or binding the soil mixture into a much stronger and more stable base than the untreated material. It is to be noted that lime is particularly effective in the high P.I., clayey soils, which are common to the Village of Fox Point and vicinity.

The decision to use lime stabilization was prompted by ever increasing maintenance costs, particularly on the older, more poorly constructed Village roads. Altogether, Fox Point has about 24 miles of secondary type roads, which were built originally with a crushed stone base, clay gravel surface, and pea gravel seal coat. Additional bituminous surfacing was usually applied every three years.

In building the block-long test project, the Village used standard soil-cement construction procedure. The street was 20-ft. wide, and like most Fox Point streets, it lacked curb and gutter; surface drainage was handled by open ditch and culverts.

Street Grade

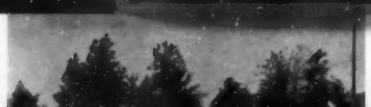
The street surface was below the desired grade and it was necessary to add as much as 4 ins. of road gravel to develop the proper crown. A low-cost minus ¾-in. crushed bank run clay-gravel was used, having 15-30 percent passing a No. 40 sieve and less than 15 percent passing 200-mesh. Coarser gravel was not used, since in earlier stabilization work the large particles were brought to the surface during mixing, making it difficult to obtain a smooth wearing surface. After the gravel was spread, the road was scarified to a depth of 6 inches, using an Austin-Western No. 88 grader. A Seaman-Andwall Pulvimixer, pulled by a Hough Payloader, was then used to pulverize the old asphalt surface and gravel base and to mix thoroughly the old and new materials.

Next, 400 bags of hydrated lime, each of 50 lbs., trucked in from the nearby Eden plant of Western Lime and Cement Co., were placed according to a predetermined spacing; these were then slit and dumped. The spacing pattern consisted of rows 4½ ft. wide, each row containing four bags; this gave a distribution of 20 lbs. of lime per sq. yd. or about 4 percent by weight. The lime was then uniformly spread with a drag towed by a pickup truck. To alleviate dusting, the surface was sprinkled lightly by means of an improvised portable 1500-gal. water tank set on a dump truck. Unlike conventional water wagons, the spray bar was attached to the front bumper, permitting visual inspection by the driver.

After initial sprinkling, the road material and lime were thoroughly mixed by the Pulvimixer, using 4 or 5 passes. Rain began to fall during the mixing operation, and continued during the remainder of the construction, making it unnecessary to add more water. (In dry weather, sufficient water is added after the first pass to bring the lime-soil aggregate mixture to the optimum moisture content.)

Initial compaction was handled with a Tampo single drum sheepsfoot roller pulled by an International TD6 tractor. About three passes were required for the roller to "walk out", i.e., where the feet no longer penetrated the material, enabling one to see daylight under the roller. The Austin-Western grader then was placed in operation to level the road and shape it to proper crown.

Further rolling was accomplished with a 9-ton Rosco self-propelled pneumatic-tired roller (3 or 4 passes), followed by a 10-ton Galion tandem flat wheel roller (2 passes). Because the rain had become so heavy during the rolling operation, it was impractical to use the flat wheel roller until the following day, when the surface had dried out sufficiently.



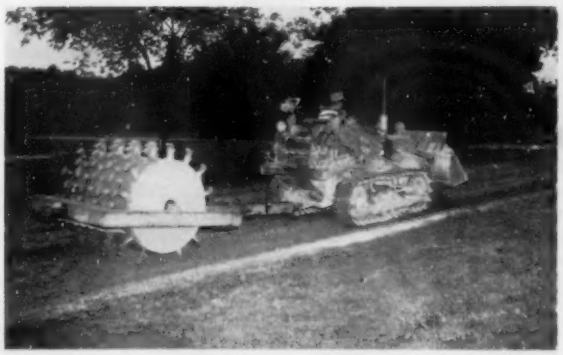
● AFTER the street was brought to grade, the old surface and gravel base were pulverized to mix old and new materials.

● BAGS OF hydrated lime were placed on a predetermined pattern to provide 20 lbs. psy, or about 4 percent by weight.

● LIME was spread by means of a drag towed by a pick-up truck to assure uniform application of about 20 lbs. sq. yd.

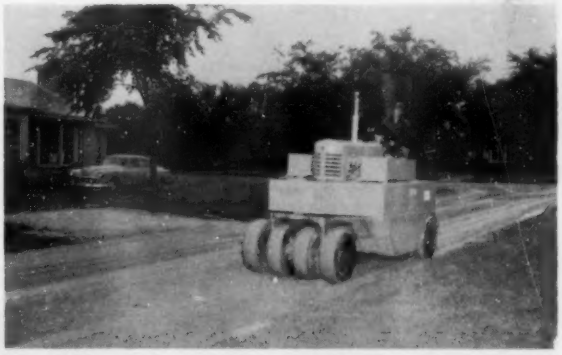
● AFTER lime was spread, the surface was sprinkled lightly to alleviate dust problem, using a 1500-gallon tank truck.

● FOLLOWING initial sprinkling, road material and lime were mixed with Pulvimixer; four or five passes were usual.



● INITIAL compaction by sheepsfoot roller. After about three passes the roller walked out. Photo taken in rain.

● AFTER compaction by sheepsfoot roller, surface was shaped by a motor grader to bring it to grade and crown.



● FINAL rolling with self-propelled pneumatic roller (3 or 4 passes) was followed by flat wheel roller (2 passes).

BETTER SIGNING *with* SIGN LOGS

R. W. WALLACE,
Highway District Traffic Engineer,
Virginia Department of Highways

● **SIGN replacement is a job for men who have been well trained in the work.**

THERE IS no single feature of a city street or state road system that gives a quicker or more lasting impression than the signs. A passing tourist may judge a city almost entirely by the ease (or difficulty) he has in following a route, learning the speed limit, or finding a parking place. It follows that neat and adequate signing is a "must".

Much has been written on the subject of standards for signs and markings but we still find variations that might lead a tourist to believe that he has entered another country when he crosses a corporate limit or a county line. Since the manual of signs recommended by the Joint Committee is available to all there is no excuse for marking that is not uniform. There will always be a special situation that calls for an off-standard sign but these are few and far between and standards will cover 99 percent of the necessary signs.

● **TAPE recorder with a lapel mike is probably the best method for logging the signs. Information is transcribed later.**

The signing of roads and streets is an important part of construction and maintenance and should receive attention equal to that given the larger and more costly phases of public works. However this item is frequently assigned to a division which considers it a minor headache to be disposed of as cheaply and easily as possible. In most cities and states sign work is a part of the road and street division. In some cities the police are responsible for both the erection and maintenance of signs. In many places the original signs are erected by one agency, such as the construction division or the police department, while the maintenance is carried on by the city engineer or public works division. Such delegation of authority in sign work usually results in a poorly signed street or road.

It is needless to say that planning the signs should be the responsibility of a traffic engineer if one is available. If not, this work should be given to some person who has received some training in signing. Installation and maintenance should also be delegated to a person who has been well trained in this field.

A comprehensive sign log is of great value in the maintenance of signs and markings and the logging and checking of signs should be a continuous operation. The erection of a sign is very important and the subsequent maintenance of that sign is no less important. There have been instances of vandalism that have resulted in complete disappearance of signs and exposed the fact that no one knew just what sign had been at a particular location. I can recall one morning after

Suffolk **DISTRICT SIGNS AND SYMBOLS**

COUNTY Isle of Wight
ROUTE 17 KEY
STARTING POINT S. end James River Bridge

G—Good
F—Fair
P—Poor
TU—Touch Up
RP—Repaint
RN—Renew

LOGGED BY RWW
DATE 8/22/56

SEC.	M. P.	TYPE OF SIGN	CODE	SIZE	S	D	COND.	SYM.	DATE INST.	DATE REPL.	REMARKS
	0.00	South end James River Bridge									
	0.12	17	G-1		W	N	G				
		32	G-2		W	N	G				
		258	G-1		W	N	P				
		Historyland Highway	G-43		W	N	G				
		Benns Church 6, Simthfield 10,	G-26		W	N	G				
		Suffolk 22									
	0.16	Speed Limit 55-45	R-3c		W	N	G				
	0.43	Trash	R-32b		W	N	G				

● **FORM used by Virginia Dept. of Highways for logging signs gives information on location, condition and need for repairs.**

Halloween when a large city discovered that nearly ten percent of its signs had been removed from their standards and carefully replaced at some other location. The result was confusion to the police, postmen, delivery men and, occasionally, to inebriated persons trying to navigate by visual aids rather than dead reckoning. Nearly six months was required to restore the signs to their right location. This work could have been done in a matter of days if a log of the signs and their location had been kept.

Useful Log Forms

There are many forms of sign logs in use and more that could be devised. I have used two that seem adequate to me, one for a permanent sign list, and the other to be used in planning. There are advantages and disadvantages in the use of either.

In the sign log used by the Virginia Department of Highways, the first column gives the section number as all cost accounting is done by IBM machines and all labor, material, and equipment charges must be to route and section. The second column is the mile post, by hundredths from the county line or corporate limit where the log is started. Column 3 is a description of the sign and column 4 the code number. Column 5, size, is generally used only when the sign is not of standard size since the code number of standard signs also gives the dimensions. Column 6 tells the side of the road, right or left in the direction of travel and column 7 the compass direction that it faces. Column 8 shows the condition of the sign at the date of inspection and column 9 tells what route symbol is on the back of the sign if symbols are used. In column 10 is listed the date of the original installation of the sign and in 11 the date of replacement. Any comments are written in column 12.

In city sign work, a physical reference to a sign location is easier to use than a mile post. On this log column 1 is a location number used for reference; column 2 is a description of the location; and column 3 the code number of the sign in place at the time of inspection. Column 4 is a space in which to list the signs needed to supplement or replace a sign or to make a comment about the assembly.

Sign logs can be made in one direction of travel only by running the route twice or in both directions by listing signs on each side of the route during one trip. In general signs on two or three-lane roads can be listed very well in one trip if traffic is not too heavy. On four-lane roads, especially those with a wide, planted median, and on heavily traveled streets it is easier and infinitely safer to log each direction, listing only those signs that pertain to that direction of travel.

To one familiar with a route the job of planning signs is very difficult. I have found that it is necessary to pretend that I am a tourist from Topeka, in town for the first time. For variety, I am occasionally from Kankakee and I once planned the signs for a medium sized city in the guise of a tourist from Acapulco. Regardless of his real or fancied domicile the sign man must see through the eyes of a stranger or he will unconsciously omit important signs.

I recently found three signs at one location which read respectively NO DOUBLE PARKING, NO PARKING, and NO PARKING 8 AM—6 PM. Townspeople were cheerfully disregarding all three, probably under the theory that if two negatives make an affirmative, three negate all regulations. The three signs were probably erected by three different persons without regard for the existing signs. With a sign log, such conflicting signs would have been noticed in the office.

In another city the route markers were so placed that at one point it was possible to travel in a circle until patience or gasoline gave out and at another point the route disappeared entirely and was found two blocks away on another street. Periodic inspections using a sign log would have prevented this confusion.

Sign logs are particularly valuable to agencies that want to get the most for their money by showing exactly how long a sign has lasted. Discounting signs damaged by accident or vandalism the sign log is a record of the life of the different sign materials used.

Making up the log is a somewhat tedious job and one that requires observation and concentration. I have made many logs solo, stopping to list each location in longhand. At other times I have taken a stenographer who was able to keep up the log while I called off the information. A tape recorder equipped with a lapel mike is probably the best method of logging as the information can be recorded and later transcribed directly to the log by a stenographer.

Whatever the method and type of log form used the sign log will be found to be an invaluable aid in sign work.

GUIDE SIGNS–CITY OF GLENWOOD FALLS

LOCATION NO.	LOCATION	SIGNS IN PLACE	SIGNS NEEDED
	Rt. 502 East From the West Corporate Limit		
	On Virginia Ave.		
1	Far right 63rd St.	G-1, 502	Add G-17e
2	50' west of 61st St.	G-1, 502	None
3	50' west of 58th St.	G-1, 502	Replace
4	Far right 54th St.	G-1, 502	Replace
5	50' east of 50th St.	G-1, 502	None
6	100' west of 44th St.	G-1, 502	Replace
7	50' east of 42nd St.	G-1, 502	Replace

● **SURVEY of guide signs shows route taken, location of signs, their description and information on needs and replacements.**

PLANNING *the* Playground

Location, area requirements, careful selection of equipment and proper installation are important factors in playground development.

NORMAN R. MILLER

Vice President,

American Playground Device Company

THE SIZE of your community or neighborhood playground is largely determined by the population to be served. Dearborn, Mich., has one of the finest playground systems in the nation. The superintendent of recreation, Henry I. Schubert, has this to say about determining the size of the play area:

"The actual space requirements of the individual playground will vary, of course, according to the number of children to be served. However, a certain minimum area is required to make possible the many activities considered desirable in a children's play program. For a neighborhood playground for children, three to five acres are needed. Considering the city as a whole, one acre of children's playground for each 1,000 of the total population is considered a reasonable standard."

The most important type of play area is the playground for children 8 to 15 years of age. This area should afford facilities for all essential play activities of such an age group. If the children's playground is part of a large park, their area should be specially developed; but under certain conditions, some of its facilities could be used by young people and even adults.

If the varied play needs of children are to be met, there is need in every neighborhood for a playground which will make possible the many fundamental and enjoyable activities.

The factors of location and size are especially significant in playground planning. It is desirable that the playground be at or near the center of the neighborhood and be reached easily and safely from all homes to be served. In general, a playground is more frequently and intensively used by the children who live in the immediate vicinity. Thoroughfares with heavy traffic, steep hillsides and natural neighborhood boundaries, however, are even more important than distance in determining the area a playground will serve effectively. These must be considered in selecting a location.

"In densely built-up sections," Mr. Schubert points out, "no child should be obliged to walk more than a quarter of a mile to reach the playground. Under more favorable conditions, there should be an adequate neighborhood playground within a half mile of every home.

The children's playground is not to be confused with neighborhood playfields which will also afford facilities for junior and high school physical education and sports programs. It is usually desirable that the neighborhood field be a part of, or near, a high school site. In general, such a playfield serves an area comprising four or five local areas, in each of which there is a children's playground. On all playgrounds consideration should be given to the development of places for nature study, outdoor dramatics, music, dancing, arts and crafts, camping and picnicking.

The National Recreation Association has set up playground standards for a five-acre site, which it regards as a good starting point for a community of about 4,000 population. Besides the primary, junior and senior apparatus areas, a five-acre playground provides ample room for other recreational facilities and activities. Nearly half of the playground is devoted to team games, such as basketball, softball, soccer and field hockey.

Overlapping of the fields permits variations in the program from one season to another, and ample space is available for one adult softball field for evening or week-end use.

The service building should be located near the main entrance to the playground and near the center of control for the children's areas. In addition to the director's office, storage and toilet facilities, the building should provide an attractive room for indoor activities. A crafts and quiet games area should adjoin the playground service building. Developed for quiet, small-group activities such as dramatics, story telling and handicrafts, this section should be removed from areas where large, noisy groups play. A wading pool could be placed close to the playground service building to facilitate control and reduce construction cost. An area adjoining the pool could be used for shuffleboard and other games.

Adjoining the apparatus area should be an open game area set aside primarily for the running, circle and throwing games of young children. A multiple-use paved area, surfaced for all-weather use, serves for roller skating, dancing or ice skating. In addition, badminton, shuffleboard and other court games can be played. One corner of the playground should be devoted to informal games involving two or several participants, such as horseshoes and croquet. The horseshoe court should be placed in an isolated corner for safety reasons.

One end of the suggested five-acre playground is used for a vari-

ety of court games. Two tennis courts should be enclosed by a fence, and also the adult area providing the volleyball, paddle tennis, badminton and shuffleboard courts. The basketball and handball courts are used chiefly by boys and young men. But several of the courts furthest from the children's section could be reserved primarily for adults.

Consideration should be given to the play apparatus areas, which are equipped with swings, slides, castle towers and other equipment. Children play best and benefit most when they play within their own age groups. The apparatus in these areas should be sized and designed to attract the interest and develop

● **EQUIPMENT installation should start with accurate location stakes.**

● **USE A level to check alinement before pouring concrete for footings.**

the abilities of the various age groups. Thus, the playground should incorporate a primary play area for children 2 to 6 years old, a junior play area for children 6 to 10 years, and a senior play area for children 10 years and older.

Equipment Factors

Only strong, ruggedly built and safe equipment of approved design should be installed. It should be free from mechanical gadgets or parts that will require constant maintenance. Apparatus units should be installed in line or in batteries to conserve ground space for the essential free-play and organized game areas, and to provide a neater, more orderly and attractive appearance, with added safety for the children.

What playground units should be purchased for the new apparatus area? This depends upon how much you have to spend, the number of children served and the amount of space available. Swings, slides, see-saws, climbing structures and merry-go-rounds are regarded as the basic units. Later, when additional funds are available, the apparatus area can be made more interesting and varied by adding giant strides, ocean waves, horizontal ladders, parallel and trapeze bars.

Benches and tables also should be installed in playgrounds so that adults may play cards and watch their children at play. They are also needed, of course, when the adults or the children have lunch or refreshments.

Playground apparatus should be sized to fit the physical abilities of the respective age groups. Table I shows proper sizes of basic units for the primary, junior and senior apparatus areas.

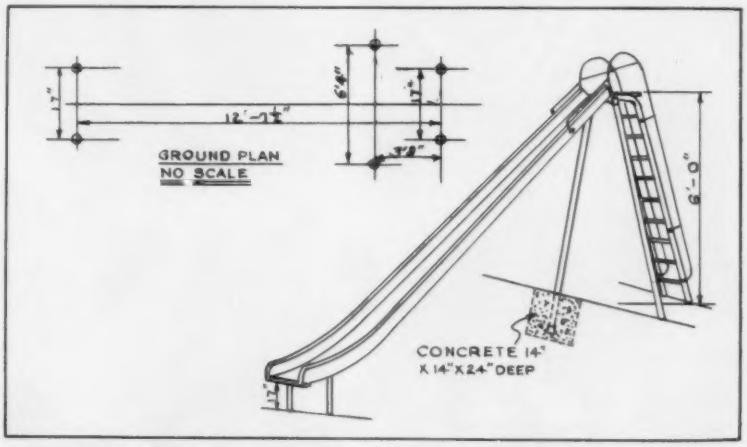
Proper installation of playground apparatus will reduce maintenance costs and promote child safety. Alinement of all frame members is necessary to assure good appearance and maximum structural strength. While the concrete is still wet and the fittings loose, a level should be used to make sure that top beams are level and straight, with vertical supports perpendicular to the ground.

Table I—Sizes of Basic Equipment

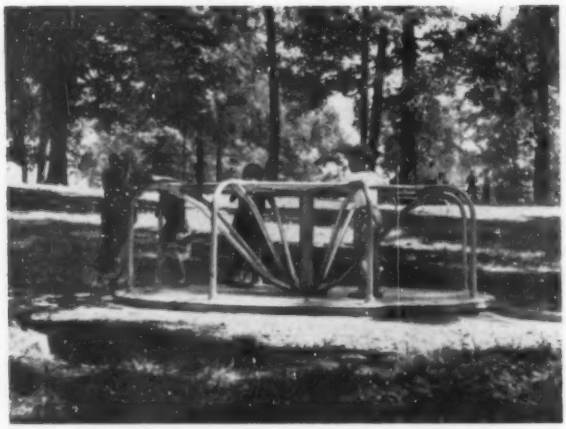
Equipment Item	Primary 2-6 years	Junior 6-10 years	Senior 10-over
Swings			
Height	7 or 8 feet	10 feet	12 or 14 feet
Slides			
Height	5 or 6 feet	8 feet	10 or 15 feet
Length	10 or 12 feet	16 feet	20 or 30 feet
Climbing Structures			
Height	7 feet	7 feet 9 in.	9 feet 9 in.
See-Saws			
Length	8 feet	10 feet	12 feet
Board width	8 inches	10 inches	12 inches
Horizontal Ladders			
Height	. . .	6 feet	7 feet 6 in.
Length	. . .	12 feet	16 feet

After alinement, the fittings can be pulled down tightly and the concrete allowed to harden. No apparatus should be attached to the frames nor any playground unit placed in use until the concrete footings have hardened for at least 48 hours; even better would be 72 hours.

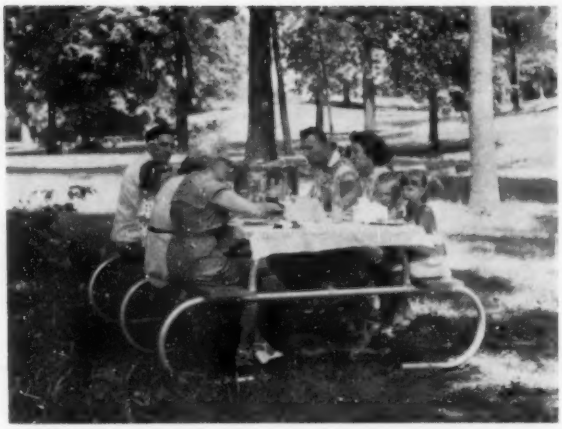
Concrete around the base of all frame support members should be troweled smooth and shaped conically so that it is highest at the



● **INSTALLATION directions furnished by the manufacturer should be followed with care to reduce maintenance. At least four inches of turf should cover the footings.**



● MERRY-go-round installation in park or playground area is always a prime favorite with many of the younger children.



● PICNIC table can be comfortable and weatherproof as well as strong and durable; but regular maintenance is needed.

pipe members proper. It is recommended that at least four inches of turf cover all concrete footings, level with the ground line. For an extra measure of safety, the turf could be covered with tanbark, sawdust or shavings to cushion possible falls from the equipment.

Timely repairing and repainting of equipment will make it last longer and provide a greater measure of safety for the children. All swings, slides, castle towers, merry-go-rounds and other apparatus should be brought into safe repair to start each playground season.

All apparatus should be inspected at regular intervals during the play season. Frequent inspections will focus attention promptly on acts of vandalism — the greatest single threat to recreational equipment. Wood parts of apparatus should be carefully inspected. Badly worn, splintery or cracked slide siderails, swing seats or see-saw boards should be repaired or replaced promptly.

There are three points to remember in connection with playground apparatus. Purchase only safe, properly sized, well-designed and sturdy equipment; see to it that it is properly installed; and then give it regular inspections and careful maintenance.

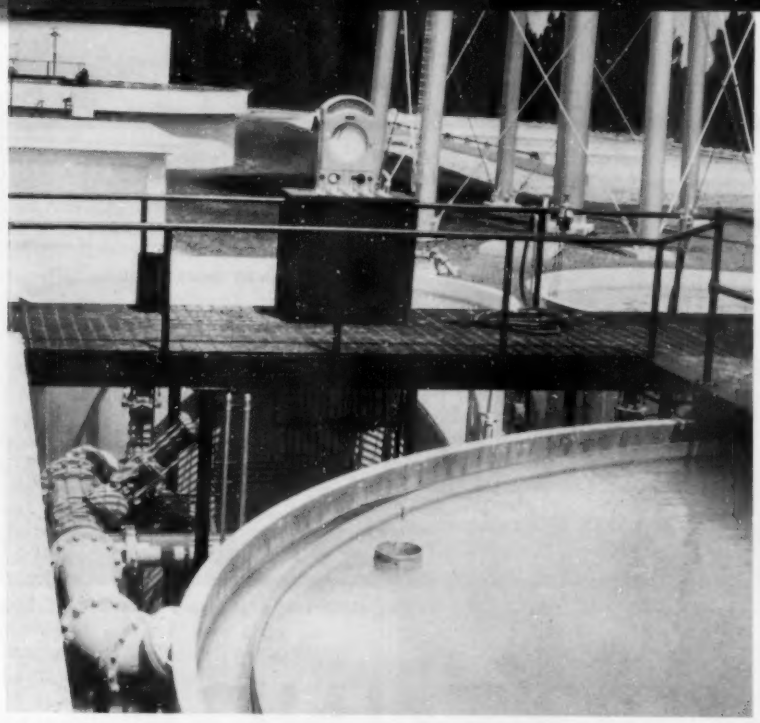
DUAL PLANTS TREAT WATER AND SEWAGE FOR A SUBDIVISION

C. E. WRIGHT

WESTWOOD LAKE is a residential subdivision carved out of raw land a few miles west of Coral Gables, Fla., by the Mackle Co., one of Florida's largest real estate developers. Under the regulations of the Florida State Health Department, which forbids the use of septic tanks in built-up areas, the developer had to provide private sewerage facilities as well as water supply. Both were designed by Philpott, Ross & Saarinen, Fort Lauderdale, Fla., engineering firm.

The water plant was originally designed for 1750 homes with provision made for ready expansion to 3,500 home capacity. Plans for this expansion are now under way. The sewage treatment plant was designed and built for 3,500 homes originally. No immediate expansion of the sew-

● HIGH RATE trickling filter plant has a capacity of 2 MGD and is landscaped carefully. It will also serve two neighboring subdivisions of 1200 and 600 homes.



● **WATER** *treatment is lime softening followed by rapid sand filtration. This view shows clarifier. Filter operating table is shown on platform in background.*

age treatment plant is planned; but future expansion is certain because the Mackle Co. has signed a contract for handling sewage from two neighboring subdivisions, Miller Heights, which is planned for 1,200 homes, and Darlington Manor, which will have 600 homes.

Capacity of the water plant, originally designed for 1,000,000 gpd, is being doubled. It is a lime softening installation, with a high rate solids contact unit followed by rapid sand filtration. Infilco equipment and a controlled air pressure system were used, with instruments by Builders-Providence and pumps by Worthington. The pumps are rated for eventual supply of 3,000 gpm. An elevated storage tank of 250,000 gal. and a 100,000-gal. underground reservoir were provided for peak loads. Wells were sunk on the property, which lies about as far west of the Atlantic Ocean as the new well field of the Miami water department, thus elim'nating danger of salt water intrusion.

A feature of the installation is that the office, laboratory and control room for both plants lie midway between the two, facilitating handling from one point. Chlorination of both water and sewage is effected from the one control room by Wallace & Tiernan equipment.

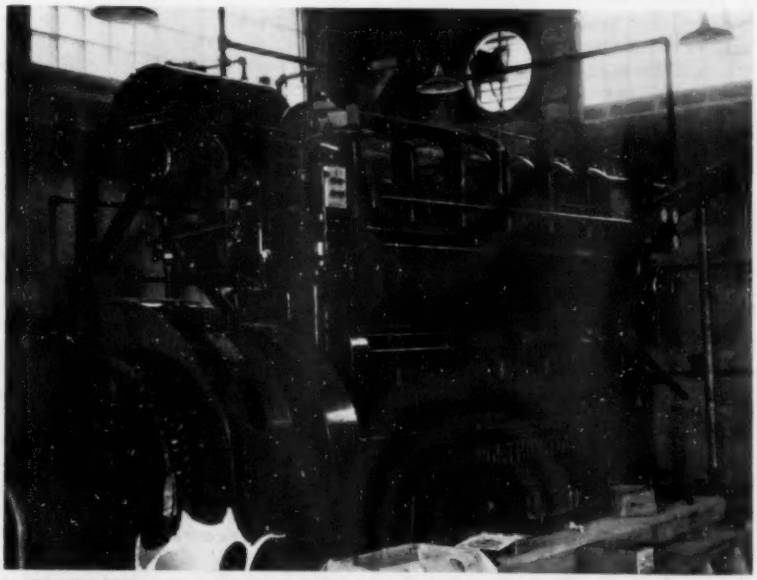
The sewage treatment plant, with a capacity of 2,000,000 gpd, is a high-rate trickling filter, utilizing Dorr-Oliver equipment with a Ralph B. Carter Co. floating cover in the digester. The Chicago Pump Co. supplied the pumps.

By the use of a Worthington engine and generator, the treatment plant can utilize either diesel fuel or gas from the sewage digestion tanks, which saves on electric power bills and affords stand-by power in case of disruption of regular service by hurricane or otherwise. As commercial electric power rates in the Miami area are governed by the peak load, the engine generator serves to cut down the excess on peak demand. When the treatment plant is completed, there will be sufficient sewage gas to carry the electrical load for about four hours each day.

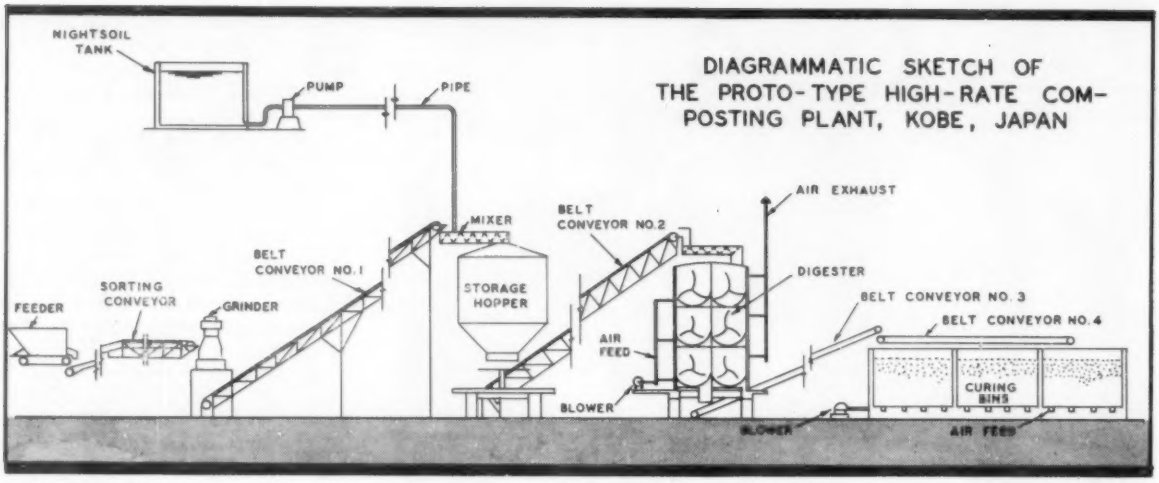
Sludge from the drying beds is being used for lawn fertilizer in the housing developments.

An unusual situation developed in the laying of both water and sewer mains. The ground water in the Westwood Lake area is high, as is the usual case in South Florida. In this particular area, however, the underlying structure of Miami oolitic limerock is so porous that it is economically not feasible to lower the ground water with well points. Gravity sewers in cuts over 4 ft. deep had to be laid under water by workers equipped with "skin diving" masks and breathing apparatus. Making water-tight joints in the vitrified clay pipes was a very difficult operation until Tylox preformed plastic joints were used. Now the lines can be laid much more easily and infiltration has been virtually eliminated.

The cost of this entire project, water and sewerage, ran to about $1,800,000. It is considered such a good example of a private system that it has been used for short course study by the Southeastern Section of the Florida Water & Sewer Operators Association. The Mackle Co. has also constructed and is operating water and sewerage utility systems at Pompano Beach Highlands in Broward County and at the Port Charlotte subdivision in Charlotte County, Florida.



● **GENERATOR** *uses either diesel fuel or digester gas; it reduces high electric rate at times of peak demand, provides standby power in case regular service fails.*



● COMPOSTING plant at Kobe, showing general layout, with provision for adding night soil, high speed digester and bins.

COMPOSTING

Your Organic Wastes at a PROFIT

JOHN R. SNELL,
Michigan Associates,
Consulting Engineers

UNDER MOST CONDITIONS and for moderate-to-large size plants, composting can be a financial success. How much profit may be made will depend on the circumstances and on the selection of the right method of processing. The purpose of this article is to give the reader a quick summary of what can be done with a properly engineered plant. New horizons are open to those responsible for the disposal of such organic wastes as refuse, garbage and sewage solids, and most organic industrial wastes. Composting offers, for most of these problems, a method which will generally be profitable dollar-wise and will definitely conserve the waste for a useful purpose.

At the present time, most municipalities spend from one to five dollars per ton to dispose of their refuse and garbage, depending on local conditions for disposal. A refuse dump, of course, offers many handicaps to a community and its surrounding areas. Flies, rats, and disease, plus odors and smoke are obvious drawbacks. Reduction in land value in the area of a dump is also serious, and an economic blight to the community.

The profit realized from the operation of a compost plant should be between $2 and $5 per ton of raw material handled—depending on the many circumstances involved. Thus, it can be seen that it is possible to go into a profitable operation, and at the same time, conserve this valuable organic matter.

In a similar way, composting will aid in the disposal of sewage solids. A compost plant handling sewage solids from an operational standpoint, can be a profitable enterprise. The unit capital and operating costs would probably be slightly more than for composting refuse because many more complexities can enter the picture. A further advantage of composting is that all three of a municipality's major organic wastes —garbage, refuse and sewage solids—can be combined and treated in one operation. Composting is improved by this combination; a better end product is obtained; and the overall economy is likewise improved. These organic wastes amount to about 10 million tons per year in United States cities and are estimated to be worth over $350 million annually.

Benefits to Industry

To industry, the benefits of composting are similar to those to the municipality. The major difference is that with a municipality, the organic wastes to be disposed of, or conserved and sold, are usually limited to garbage, refuse and sewage solids. With an industry, there may be a wide variety of organic wastes, but only certain industries have large quantities of such wastes. Typical examples of industries that can best be benefited by composting are the canneries, meat packers, paper mills, saw mills and tanneries. Frequently the present method of disposal of these wastes is costly, inefficient and wasteful of the organic materials involved; yet with a proper application of the composting process, the reverse could be true. A good example of this industrial application is the stockyard. The largest stockyard in the United

States has approximately 140,000 tons of manure taken from the yards each year. At the present time, 90 percent of this is disposed of at an annual cost of about $70,000. Plans are presently under way to change this deficit into a profit through the application of composting.

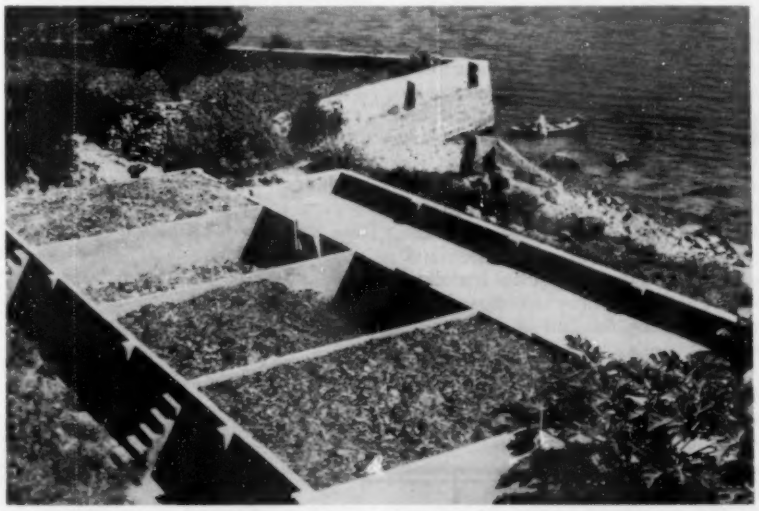
The Composting Process

Modern composting is essentially a fast, efficient aerobic process, a contrast to the older methods. In modern composting, the stabilization of organic matter is accomplished by bacteria and other microorganisms which use large volumes of oxygen and produce considerable quantities of heat. Temperatures of 160°-170°F are easy to maintain; thus all disease producing organisms are killed quickly. For good composting, the following conditions should be maintained:

1. Raw material should have a carbon to nitrogen ratio of 50 to 1 or less. It should have no serious deficiency of essential foods and should be within a normal pH range (5.5-8.0).
2. Material should be finely ground.
3. Moisture should be controlled to 50-60 percent throughout the process.
4. Seed compost should be recycled in the amount of 1 to 10 percent. Biological additives appear to have no beneficial effect as inoculants.
5. Air should reach all parts of the composting material with at least 50 percent of oxygen remaining.

If high-rate composting is to be employed, the following additional conditions should be maintained: (1) Constant slow stirring or intermittent stirring every 5 to 10 minutes; (2) controlling the temperature throughout the process; (3) preventing the pH from going too high to avoid nitrogen loss; and (4) continuous flow in 3 or 4 stages including recycling of seed and thorough mixing for each stage. The last stage may combine slower digestion with natural drying from the produced heat.

High rate composting can usually be accomplished in one to three days, but this rate requires a properly engineered mechanical digester. Composting can be efficiently accomplished without the expense of a digester, but may take 10 to 15 days. The objective of composting is not to digest all the organic matter but only the putrescible material which will attract rats or flies. Breakdown of the remaining material is best accomplished in the soil where this further decomposition stimulates soil bacteria and plant growth. The major objectives in composting should be to: (1) Stabilize putrescible organic matter; (2) kill all pathogens; (3) conserve the nitrogen in the raw material; (4) produce a uniformly ground, dry end product, free from objectionable, harmful objects such as glass; (5) conduct the process so as to be free from flies and odors; and (6) operation in as inexpensive, uninterrupted and fool-proof manner as possible. Further basic research on the mechanism of more complete nitrogen conservation during composting is desirable.



● **CURING bins at the Kobe plant are shown here. High rate composting is followed by storage in these bins for final curing. Bins are 4 to 8 ft. deep and aerated.**

Methods of Composting

Except for complete conservation of the nitrogen, all the above objectives can be fulfilled by combining much of the present day knowledge and experience from the various groups who have been actively experimenting with composting.

Although many approaches to composting exist, the writer would recommend three as being most efficient and economical. They are mechanical digestion, use of modified windrows, and bin composting. Six mechanical digesters are presently on the market but three of these use a method which is essentially a batch process. The three continuous flow mechanical digesters are as follows:

1. The *Dano* digester, used to some extent in Europe, consists of a single slowly revolving horizontal cylinder which holds the material about 5 days. The longer digestion periods are required to make up for lack of complete control of the materials. Wet, sticky material is handled with difficulty for it forms balls which become anaerobic inside. A small modified Dano plant is in operation in California.

2. The *Earp-Thomas* digester is designed as an eight-deck vertical cylinder. Material is agitated and aerated by plows on arms which are turned from a central vertical shaft. A modified model was used for two years at Michigan State University for pilot scale research. Lately the A. O. Smith Company has redesigned this digester to improve the mechanical features.

A 50-ton Earp-Thomas digester is in service in Oregon; and a similar type installation has operated at the Paris, France, municipal plant for about four years.

3. The *T. A. Crane* digester, originally a modification of the Earp Thomas-Crane digester, is a three-deck horizontal unit having separate agitating and aeration mechanisms for each level. Provision is made for increased aeration by forced air and blowers. It is believed that reseeding is well provided for. Control of the rate-of-flow-through of material is adequately provided for and a considerable weight of material can be handled per unit weight of digester. The first T. A. Crane type digester constructed was the 30-ton per day prototype plant in Kobe, Japan. Estimated costs, using Japanese labor, were $2.20/ton of dry end product. After some further experience, the government of Japan plans

to subsidize similar but larger plants in 38 cities in the next 5 years. Under the auspices of the World Health Organization, the writer has acted as a consultant on this plant.

Non-Mechanical Composting

Modified Windrows: Windrowing, using forced air and periodic turning and shredding, is much more efficient than, and requires less than half the time of, ordinary windrowing. Material should be piled in long windrows 4 to 6 ft. high and 8 to 12 ft. wide. Under each row is an aeration pipe which forces air in controlled amounts through the material. A special machine developed and manufactured by the American Dross Disposal Corporation picks up, shreds and lays down all the material several times during the process. This machine can be used on municipal refuse without previous grinding, although by so doing, its normal capacity is reduced somewhat. The same operation can be accomplished, but with less efficiency with a front end loader and a large shredder. An initial installation at the Omaha stockyards is scheduled for the fall of 1957. The writer's preliminary engineering report concerning this problem indicated composting costs for raw stockyard manure at $1.00 per ton or a cost of $2.50 per ton of dry end product, exclusive of land or cost of collection.

Bin Composting: Composting of ground and seeded material in bins 4 to 8 ft. deep, employing controlled amounts of forced air from the floor, is also recommended. This method was first developed at Michigan State University as a second stage of the high-rate mechanical digester. The first full scale bin composting plant was completed in Kobe, Japan, for the same purpose. The Kobe plant has been designed so that the bin composter may also be used by itself without the mechanical digester. Kobe results of bin composting should be ready by early 1958, and are expected to be at least competitive with the other two composting methods recommended above.

In any composting plant there are two phases of design which must be adequately provided for in order to assure success. The first is a problem in the design of materials handling. Everyone doing anything in this area has experienced troubles, but now there is a sufficient backlog of experience so that further errors should be eliminated. The second problem in design necessitates mastering the science of economical composting which is a much more complicated problem, and is not one to be treated lightly by either the consulting engineer or the prospective owner.

Marketing the End Product

Composting of organic wastes is economically competitive with other methods, even if the stabilized end product is thrown away. The real economy of the process comes if the compost is disposed of at a fair price. The estimated theoretical value of composted municipal refuse is between $20 and $30 per ton on a dry basis; but a sale price of only $5 per ton should still net a small profit to a municipality of 100,000 population or over. Limited experience of various producers of organic compost indicates that unlimited markets to farmers are available at $10 or less per ton, and very substantial markets at $60 to $80 per ton (in 50-pound sacks) to urban users. It is believed that the ordinary municipality should sell the material in bulk to commercial companies already set up in the fertilizer business. Eventually organic composts will be enriched by chemicals and sold in a variety of useful formulas. Marketing of organic wastes will take care of itself as soon as substantial volumes are composted and available.

Using a Backhoe for Mosquito Control

TRACTOR-MOUNTED equipment is doing everything these days—even fighting mosquitoes. This unique application is reported by the Monmouth County Mosquito Exterminating Commission, Red Bank, N. J. Their job is to clean more than 450,000 feet of brooks, trenches and laterals to prevent mosquito breeding. Clean trenches permit a constant flow of water which deters the hatching of the mosquito eggs, whereas standing water is favorable for hatching. More than half of the 450,000 feet of these trenches were cleaned with a Henry backhoe, mounted on a tractor that crawls on 36-inch wide wooden pads. A clamshell crane was used on the remainder of the ditches.

● **MOSQUITOES lose a breeding spot when the edges of streams and trenches are kept clean. This tractor-mounted Henry backhoe does the job in Monmouth Co., N.J.**

The backhoe is used to scoop out loose mud and debris and to make fresh, sharp cuts along the sides. The clean and sharp cut of the trench is important; otherwise, irregularities create dead water areas permitting breeding.

The backhoe is used on all the narrow, hard-to-reach and hard-to-clean trenches. With it, 1,000 feet of bank can be graded in 8 hours. Formerly, four men, working with shovels and hoes, could clean only 400 feet in 8 hours.

• • •

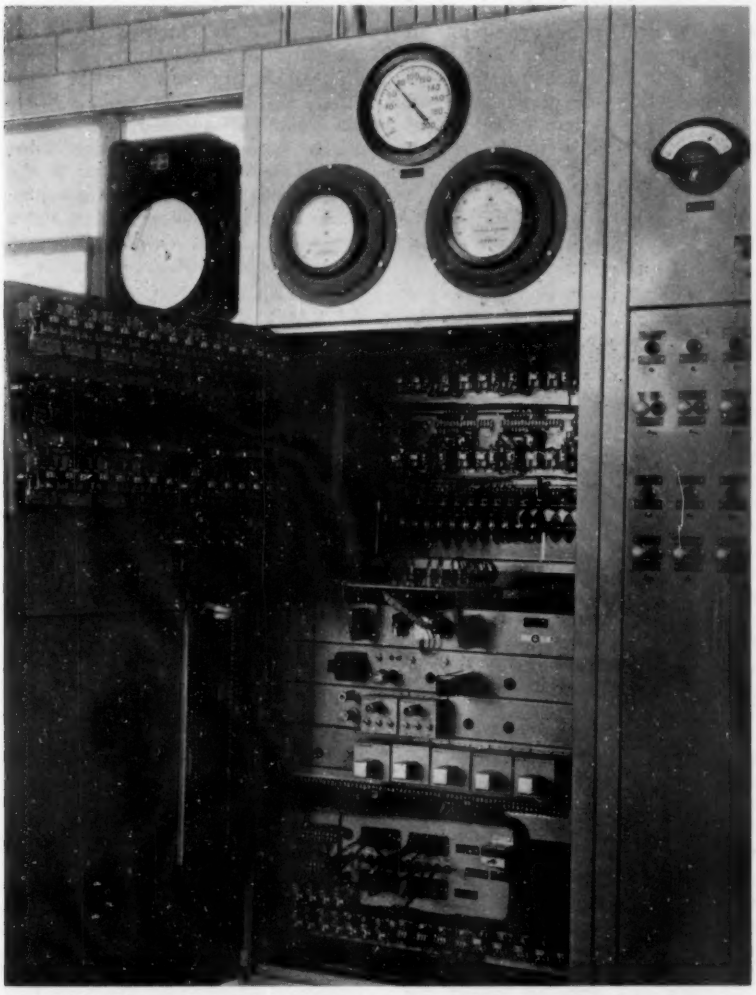
Garbage Cans Are Being Tagged Too

City policemen in Alva, Okla., are tagging something besides automobiles—garbage cans. A new ordinance requires tight lids on all garbage cans and officers have been making a can-to-can check, putting tickets on those violating the law.

TELEMETER CONTROLS OPERATE 23-WELL SYSTEM

AN AUTOMATIC control system is part of the improvements to the water system of Midwest City, Okla. A recurring water shortage has been solved by drilling new wells, adding storage capacity and constructing a new pumping station. The eight motor driven Fairbanks-Morse pumps in this station; three other pumps at a station 1½ miles away; and 23 well pumps within a 2-mile radius are automatically operated from the new station by telemeter electro linkage interconnected over leased wires built by the local telephone company. The system also controls the water level in three ground reservoirs and in an elevated tank of 600,000 gals. capacity. The eight F-M Pomona pumps in the new station have a combined capacity of 7,500 gpm.

Midwest City came into being some 16 years ago with the establishment of Tinker Air Force Base. Water supply was a problem almost from the beginning. First, there was the basic problem of limited flow from wells. Nothing could be gained by drilling large diameter wells and depths beyond about 800 feet tapped salt water. Accordingly, many small wells had to be drilled at considerable distances apart. Second, water mains, designed initially for a village with two drilled wells were small, and, with the addition of numerous subdivisions, were almost completely inadequate. Third, collection lines and feeders from the increasing number of wells created a complex system difficult to control manually. Fourth, increased booster capacity was needed to deliver water at adequate pressure to the sprawling city.



● **THIS UNIT automatically controls operation of 23 wells and 11 booster pumps and also maintains desired water levels in three reservoirs and an elevated tank.**

With the water situation growing more critical, Collins and Flood, consulting engineers, were engaged. They prepared plans for a new pumping station, new wells, and new reservoirs; correlated automatic operation of all the pumps; and designed a perimeter water main loop and a new collection system with a feeder main to the new pumping station. The water quality was satisfactory without treatment.

The two new 1.5 mg. reservoirs take the output of 18 wells and the original station downtown takes the flow from the other five. The 23 wells yield 6000 gpm or an average of 260 gpm each. To stimulate flow it is sometimes necessary to treat the wells with sodium hexametaphosphate which increases the yield.

With adequate storage, booster capacity can function at a substantially higher level. For brief periods during summer evenings, use of water greatly exceeds well supply but it is expected that in the future supply will be brought somewhat closer to booster capacity by drilling more wells or by obtaining a surface water supply and building a treatment plant. Meanwhile the exact control of well output has increased the usable supply of water.

The new pumping station, of brick and tile construction, is located on

top of one of the new reservoirs, both of which are concrete covered to prevent water contamination. This location of the station permits the pumps to take suction efficiently from the reservoir. Pumps are grey on red tile floors. Steel trusses and ceiling are aluminum coated.

In the new Station No. 2 there are six F-M Pomona vertical 1000-gpm 225 tdh pumps with non reverse ratchet, driven by 75-hp motors, and two similar pumps of 750-gpm against 200 tdh driven by 50-hp motors. In Station No. 1, which is the original pump house at City Hall, there are two F-M motor-driven centrifugal pumps of 500 gpm capacity and one of 300 gpm. Emergency Station No. 2 has three older motor-driven horizontal F-M centrifugal pumps, one 1000-gpm, one 500-gpm, and one 800-gpm. The 800-gpm pump is connected to a gas engine for standby service. These three older pumps are not in the automatic control system.

The three pumps at Station No. 1 and the eight new ones at Station No. 2 are automatically operated. All told, 23 well pumps and 11 booster pumps are integrated under automatic control.

Electrically there are three general systems. One of these is switch gear for the booster pumps; another is telemeter control of the well pumps; and a third is telemeter control of the booster pumps. The tower at City Hall carries a static head of 165 feet. City main pressure averages 75 psi. The two reservoirs at Station No. 2 are self equalizing. The reservoir at City Hall is normally full.

Height of water in the three reservoirs relays signals to the well pump control panel where a selector cycles the well pumps into service progressively thus working a well a while and resting it a while. As the demand for water increases or decreases, more pumps start or stop at the wells. Booster pumps at two stations are similarly cycled into service by water pressure in the mains.

The small No. 1 Station is switched on at 11 pm to carry the full pumping load, but if it is not equal to the demand, one or more pumps at No. 2 Station, a mile and a half away, start up and help out until they are no longer needed. At 7 am the time clock shuts down the No. 1 Station and starts up the larger No. 2 which has been helping No. 1 with intermittent pumping as required during the night. Since not all of the pumps at Station No. 2 are needed at one time, the selector picks them up in rotation so that all pumps do an equal amount of work.

● **STATION No. 2 is equipped with six vertical pumps with 1000 gpm capacity, driven by 75-hp motors, and two 750 gpm pumps. Total station capacity is 7500 gpm.**

Provision is made in the well pump control panel to plug in various groups of wells and plug out others so the telemeter system will progressively cycle into service all pumps in the group selected for work by the man in charge.

Control Instruments

Instruments on the control panels show water pressure in the mains and height of water in the reservoirs. Other instruments indicate and record the flow volume and the pressure in mains.

There is a system of red and green telltale lights on the control panels. When the signal calls for a pump and it responds, a green light is illuminated. If it fails to respond, a red light shows and an alarm is sounded. Another pump comes on automatically and in the meantime the man in charge can trace down the trouble in the circuits or relays.

The outside telemeter lines are maintained by the telephone company between stations and field pumps. If anything goes wrong with the inside circuits and the operator cannot locate the trouble, the pumps can be push-button started and stopped.

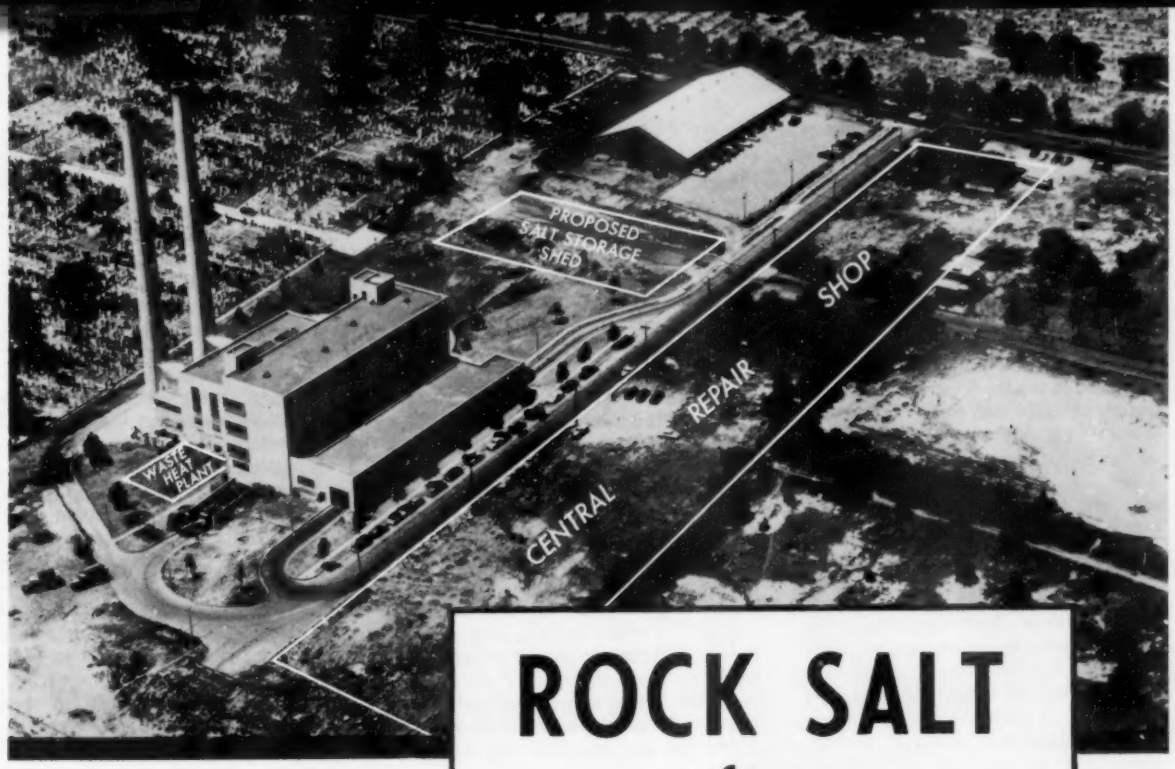
If a storm downs the telephone circuits, pumps can be operated by manual controls. Should electric power fail completely, water can be pumped with the gas engine in the auxiliary station to meet emergencies. This engine is started and test run at regular intervals.

Starting and stopping surges, air release, and prevention of back flow through idle pumps are ingeniously handled by a combination of automatic pump control valves and air and vacuum valves. Surges due to start, stop and air or water hammer are virtually non-existent. Also, to prevent line breakage or excessive pressures in case of manual operation of the pumps, a pressure relief valve is installed on the discharge manifold. This quick-opening, slow-closing valve, automatically actuated, delivers bypass water to the clear well if excessive pressures develop. The function of this valve is such that no surge is created during the operational cycle.

Only No. 2 Station works during the day and evening peak periods. Ordinarily not more than four of the eight pumps will run at one time. During minimum winter demand, one of the 1000-gpm. pumps may be sufficient. The arrangement is sufficiently flexible to operate each pump at maximum capacity and therefore maximum pumping efficiency.

The new system has economic advantages that will show up on the balance sheet at the end of the year. The cycling telemeter system does the work of one man otherwise required to "ride circuit" from well to well. It permits selective operation from a central point and elimination of operation at low static head at the wells. It automatically distributes the work among the pumps and longer life is therefore expected.

Robert W. Quinlan is city manager and Roscoe Flinchum is Water Superintendent. Fairbanks-Morse furnished the pumping equipment described. Controls were by Automatic Controls Co. Sparling furnished gauges and the recording equipment; and Clayton Co. the surge control valves.



ROCK SALT for SNOW and ICE REMOVAL

• CONSTRUCTION of a 9,600-ton salt storage shed is proposed as part of the development of New York's Betts Ave. Sanitation Center. In addition the incinerator will be enlarged, the existing garage modernized, and a new Central Repair Shop and a Waste Heat Plant will be constructed at the site.

C. A. ROGUS,
Director of Engineering, Department of Sanitation, New York City

TODAY'S concentrations of urban populations and dependence on rubber tired vehicles for the transportation of personnel and supplies demand dependable and prompt removal of snow and ice from street areas. Communities met this demand at first with improvised and generally inefficient methods. With time, however, snow and ice removal have become a preplanned, organized and efficiently executed operation. Mechanical plowing, loading and handling of snow; use of mechanically applied abrasives and salts for icy conditions; and advance use of weather reports have become quite routine. Rock salt is now generally acknowledged to be a most potent aid in combating winter storms, but in its storing, handling and using there remain many problems, controversial claims and conflicting opinions. The object of this article is to review alternate control methods and to discuss the merits and problems connected with rock salt usage.

The importance of unhampered traffic flows is well recognized. Factual appraisals, however, are generally lacking. An economic analysis on this point, as made for the City of New York with its 8,000,000 population and an average of eight annual winter storms, is presented here in summary form as a guide. Extrapolations, based on respective populations and winter storms, should have reasonable validity for other cities.

Passenger Transportation—Of the 4,000,000 working population (including some 700,000 from outside the city limits) about 800,000 are dependent on buses and about 750,000 on automobiles for essential transportation to and for business. If we assume but one hour loss due to a disruption of normal transportation services per employee per storm—at a minimum of say $3 per hour to cover attendant losses in production, sales or services—the total annual loss would exceed $30,000,000.

Truck Shipments—Intra-city distribution of perishable foods is estimated at about 25,000 tons per day. Fuel oil and coal distributions account for another 7,500 truck days. These services, as differentiated from shipment of other non-perishable or less essential supplies, if delayed, would produce substantial hardships. A one hour delay per storm, with attendant overtime payments and other secondary losses, would cost about $2,000,000 per year.

Refuse Collection—The City's essential collection of refuse by sanitation and private cartmen per average winter day requires about 5,500 truck trips of 50,000 truck miles. Again, a one-hour delay per storm with attendant overtime payments would cost about $300,000 per year. Longer delays would pose serious environmental sanitation and health problems.

Fire Prevention—The New York Fire Department protects over 700,000 buildings with an assessed valuation of more than $25,000,000,000. In spite of its excellent record of confining more than 99 percent of fires to the immediate area involved, the fire losses per winter season (December through April) average $11,000,000. There is no practical way to evaluate the effect of delays on fire losses. Obviously, however, impeded access could result in alarmingly greater losses than the present $1.40 per capita per winter.

Medical—House calls, most of which are of an emergency nature, if impeded by inadequately handled snow and ice storms increase the cost to the doctor but more importantly could have serious consequences to the patient. Ambulance services can be similarly affected. Of the 20,000 practicing doctors in the City the majority depend on automobiles to render professional services. It is also reported that ambulance calls average 1,000 per winter day. A rough approximation of the monetary worth of an hour's delay in both of these services amounts to over $2,500,000. The effect on life and health is immeasurably greater.

Miscellaneous—Utilities such as telephone, electricity, gas and water require large fleet operations for normal daily maintenance of these services. Under storm conditions, the maintenance workload is greatly increased. If prompt repairs are impeded, substantial losses to perishables and to business will result. It is most difficult to estimate the extent of such losses, but a one hour delay could be worth about $5,000,000. The indirect losses would be substantially greater.

Safety — Failure to implement prompt and adequate snow and ice control measures results in numerous pedestrian and vehicular accidents, some major, some minor, but nevertheless all costly and in the least having a high nuisance value. Alleviation of such accidents would effect substantial savings in insurance rates, litigations and payment awards to plaintiffs.

The Police Department's records show a substantial difference in accidents due to skidding between the years prior to and subsequent to progressively increased usage of rock salt. Thus the years of pre-salt usage, 1930 to 1936, showed an average of 21 fatalities and 1635 injuries; while the ten years of progressively increasing use of rock salt, 1940 to 1950, showed an average of 9 deaths and 736 injuries per year. No statistics are available on damages to vehicles but it can be safely assumed that they decreased with salt use at least as much as personal injuries.

One cannot overlook at this point, too, the potential effect of iced highways on the much discussed Civilian Defense aspects of today's life.

Economics—Proper snow and ice control measures will cost from 20¢ to 45¢ per capita per winter depending on size of municipality and its climate. The $3,000,000 average cost per winter for the City of New York is but 0.15 percent of its annual operating budget, whereas the savings are incomparably greater. For instance, if prompt and efficient snow and ice removal reduces traffic delays but one hour per storm, the direct annual savings to the public exceed $40,000,000. The tangible savings and health benefits are very much larger.

Alternate Methods

The methods other than salt most commonly used or advocated are: Abrasives; radiant heat; melting machines; chemicals; brines and various salts.

Abrasives—The sole purpose of spreading abrasives on icy pavements is to improve vehicle traction. Small amounts of salt are usually added to reduce caking and to increase imbedment into the hard icy surface. Various types of abrasives are used. Those tested and evaluated were: (1) Sand—a screened gravel (2590 lbs. per cu. yd.); (2) ashes—run of the mill, household or commercial residue from coal combustion, predominant in fines but with some clinker, coke and shale (1460 lbs. per cu. yd.); (3) slag—a mineral waste by-product from a metal smelting and refining process (3070 lbs. per cu. yd.); (4) grit—a uniformly graded waste by-product from coal fueled utilities (2510 lbs. per cu. yd.); and (5) rock salt—sodium chloride crushed to grade CC fineness (2060 lbs. per cu. yd.).

The relative efficacies of these abrasives and of rock salt alone, as measured by braking tests on a 1/16-inch thick ice, are shown in Table 1. All abrasives had an admix of rock salt of 200 lbs. per cu. yd. Materials were mechanically spread at a setting and vehicle speed to produce a theoretical rate of spread of 0.25 lb. psy for the rock salt. The actual rates of spread on an area of 30,000 sq. ft. are shown in the table.

It was concluded from these tests that salt applications at 0.25 lb. psy for thin ice conditions was excessive and a rate of 0.167 lb. was deemed adequate. At this latter rate the total annual cost for combating icy pavements would be no greater than for the cheapest abrasive while the end effect on street cleanliness, sewers and sewage treatment plants would be superior.

The commonly recognized disadvantages of abrasive are: (1) Their use is limited to icy pavements; spreading on snow handicaps rather than assists in its removal; (2) they are blown away from hard icy surfaces; (3) they insulate the ice surfaces from the sun thus slowing down natural removal action; (4) they must be swept off the streets and removed periodically from catch basins, sewers and sewage treatment units; and (5) generally they are messy when tracked into homes and buildings.

Radiant Heat—Heating coils, circulating hot water or antifreeze solutions at about 100° to 110°F, have been used quite extensively in recent years. To be economically sound, these systems must be limited to relatively small areas requiring abnormal de-icing activity because of high pedestrian or vehicular traffic, as ramps, sidewalks, garage and building entrances, and pedestrian crosswalks. Also a nearby inexpensive heating source is essential.

Melting Machines — This is a highly impractical alternative. Two basic designs have been suggested, both very costly: (1) A hooded, direct flame application similar to that used in repairing asphalt pavements; (2) an oil fueled, multi-jet, heated

Table 1—Results of Braking Tests

Remarks	Sand	Ashes	Slag	Grit	Rock Salt
Average in lbs. per sq. yd.	.34	.75	.46	.45	.37
Braking distances in feet at 15 M.P.H.[1]	31	18	28	31	17[2]
Relative traction effectiveness	.48	.83	.54	.48	1.00
Estimated median rates of spread in lbs. per sq. yd. required for equal braking distances of 17 feet	.54	.15	.50	.20	.27
Comparative annual costs[3] for 3 ice storms per year	$201,000	$99,000	$195,000	$113,000	$100,000

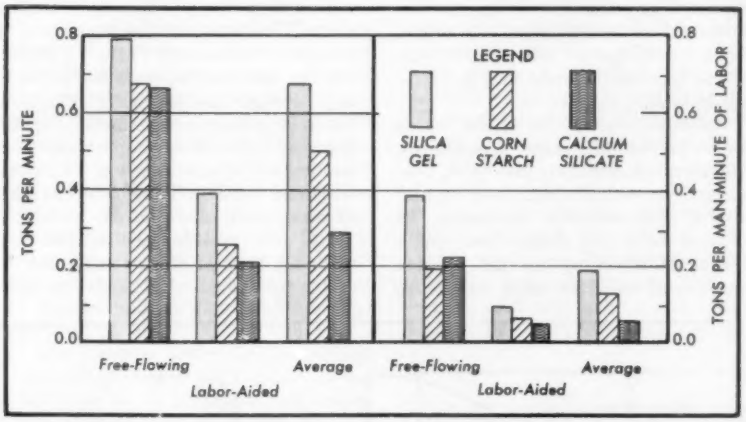
[1] Average braking distance on: a. dry pavement = 4.5 feet; b. ice film = 76.6 feet; c. distances shown in table are for slurries (mixtures of abrasives and salt melted ice) which tended to reduce traction.

[2] 30 minutes after spreading.

[3] Estimated costs based on using salt admixtures of 100 lbs. per cu. yd. of abrasive, and a spreading rate for salt alone of 1/6 lb. per sq. yd.

hopper mounted on a trailer requiring advance snow plowing and loading for its operation.

Chemicals—Most of these appear to be some variant of aluminum chloride. Although laboratory tests indicate that they have a considerably higher effective melting rate than rock salt, the limitations of mechanical spreading devices make impossible the minute, uniform spreading essential to take advantage of these costly concentrated salts. Their melting efficiency, as determined by field tests, was much lower than their 60:1 cost ratio to rock salt. In addition, the health and safety hazards entailed in their use prohibit large-scale applications.



● **COMPARATIVE rates of discharge of salt admixed with ½ percent by weight of anti-caking agents after test storage from 9 to 13 months in large concrete silos.**

Brine—Spraying salt water (fortified as necessary with rock salt) over snow and ice, appears at first to be attractive to coastal cities with an unlimited supply of sea water. Analysis, however, shows this method to be costlier, mostly because these very dilute salt solutions would require the pumping, trucking and spraying of much greater volumes. The more rapid corrosion of flushing equipment, the increased loading on sewers and sewage treatment facilities and the hazards of spraying polluted waters on the streets negate this alternative.

Marine Salt—This salt, either an imported end product from salt water evaporation or a domestic hydraulically mined salt, is limited by its nature to fine particles. It does not have the desirable particle gradation of mechanically mined rock salt. Field tests were conducted to determine its efficacy on icy pavements and on snow blankets. Observations were made on the rates of melting, effect on traction (braking tests), ease of handling, storing and spreading. The general conclusions were:

(1) Its fineness would permit an economic spreading rate of ⅛ lb. psy and would provide good uniform coverage. It melted thin ice films, ⅛ inch thick or less, more uniformly (as distinguished from the spotty melting under the larger rock salt crystals) and braking tests indicated that non-skidding surfaces could be secured a bit more rapidly. The use of this salt on icy pavements could effect a saving in the amounts of salt used of about 50 percent.

(2) Tests on snow 1 ins. deep showed that, volume for volume, coarser rock salt was superior, providing traffic mixed and worked the larger particles around, producing a mealy slurry, improving traction and facilitating snow plowing.

(3 Marine salt caked more rapidly and extensively; increased the loading time into mechanical spreaders; and jammed spreader mechanisms so as to require manual assistance.

In the light of the above, coupled with the undesirability of storing and handling two types of salts, it was concluded that the limited advantages of marine salt did not warrant its usage.

Calcium Chloride — Records for the New York City area show that in the last ten years temperatures dropped below 12°F but 43 times and then only for relatively short periods. Nevertheless, a study was made of a 1 to 3 mixture (calcium chloride to sodium chloride). During a field test, temperatures varied from 0 to 15°F, with generally sunny weather and moderate winds. The snow was 3.7 ins. deep, dry and fluffy. The mixture was spread on half the test area (a 60-foot avenue with blocked-off traffic) and sodium chloride over the other half for control purposes, both at the rate of 0.25 lb. psy. It was observed that after 12 night hours the snow covered with the mixture had a softer consistency and slightly shrunken depth, but the conclusion was that rock salt, even under those adverse conditions, gave the most economical protection.

Rock Salt

The use of rock salt poses questions as to the proper specification; rates of application; amounts to be stored; and methods of storage. It requires an objective evaluation of its damaging and corrosive effects and demands corrective steps therefor. The problem of caking must be solved.

Specifications — ASTM Standard Specifications for Sodium Chloride (Designation D632) is for general road stabilization purposes and there is some question as to its complete suitability for de-icing purposes. A more acceptable sieve and chemical analysis of grades No. 1 and CC, as furnished to the City of New York, is presented, particularly as to "fines" and moisture content. When rock salt is subject to above normal handling a mix of No. 1 and CC grades is advocated to reduce excessive fines, alleviate caking and promote "boring" action through snow and ice blankets.

Chemical analysis of our salt shows moisture 0.023 percent; water insolubles 1.00 percent; other salts 0.777 percent; and NaCL 98.200 percent.

Table 2—Average Screen Analysis

Tyler Mesh Screen No.	Percent Retained	
	CC Salt	*No. 1 Rock*
3	—	15.4
4	12.4	56.2
6	40.3	23.3
8	31.3	3.3
10	13.5	—
CC salt through 10-mesh		2.5 percent
No. 1 salt through 8-mesh		1.8 percent

Rates of application may be stated as lbs. or cu. ins. psy; or lbs. or tons per mile. A rate of 0.25 lb. psy equals 5.70 cu. ins. psy or 2930 lbs. per mile of 20-ft. roadway.

Correct rates of application depend on many variables and specific recommendations would be misleading. There is almost general agreement however on the need for spreading early in the storm—unless a rapid temperature rise to

above freezing is a certainty. A generally accepted initial rate for sleet and ice storms would be about 0.125 lb. psy; that for snow storms about 0.25 lb. psy. This initial application normally will:

(1) Completely remove thin ice and snow coatings without recourse to plowing; (2) soften thicker snow and ice blankets to facilitate plowing operations; (3) reduce the bond between ice or packed snow and the pavement surface so as to ease removal; (4) shrink the volume of snow and facilitate the subsequent plowing and removal operations; and (5) improve traction by promoting a mealy slurry through the mixing and churning action of traffic on the salt and snow mixture.

Deeper snow blankets, continued low temperatures and hampered traffic conditions may warrant further applications.

Salt Storage

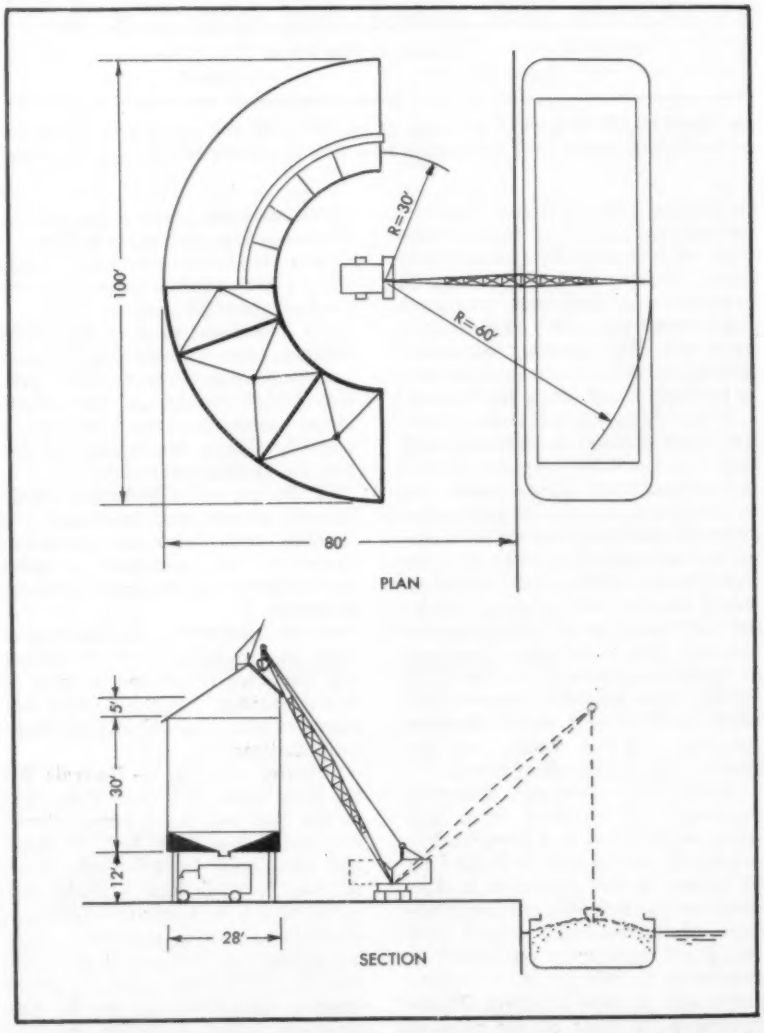
The amount of salt to be stored should equal the anticipated needs for winter plus a reserve for emergencies. Records of amounts used in preceding years may be misleading unless the usage of salt has already been developed to its peak potential. The ever-increasing public demands for better and more snow and ice control may require greater amounts. The potential amount of salt required can be best arrived at through estimates based on the number of winter storms, overall surface areas of streets needing deicing and specific unit rates of application. Snow and ice control practices and salting needs vary with weather conditions, topography, population and industrial densities and public attitudes. Cities in the snow and ice belt with hilly streets, high building densities and public demands for near-normal travel conditions at all times require maximum salt usage and storage. Their "salt" storms would probably be defined as: (1) Snow falls, 1 inch or more in depth, with air temperatures at or below 32°F; and (2) ice falls (sleet, glaze, frozen slush) in fractional thicknesses, with air temperatures at or below 32°F.

Determination of street areas requiring salt treatment is a highly local condition. Roughly, it will amount to from 50 to 70 percent of the paved street areas. Ice storms should be handled with about 0.125 lb. psy and snow storms from 0.25 to 0.50 lb., averaging 0.375 lb. psy. On these bases, the annual needs for the City of New York are about 80,000 tons—60,000 tons for average anticipated weather conditions plus 20,000 tons more in reserve for unforeseeable emergencies.

Procurement of salt in advance of the winter season safeguards against the vagaries and undependability of winter shipments and results in lower overall costs. Purchase and handling in bulk (by the ton) is preferred. Deliveries may be made by truck, box car or barge, while unloading may be manual or by bucket, pneumatic conveyor or crane, or a combination of these. Local conditions will determine which type of delivery and unloading is best.

Outdoor storage in some cases seems to be the most economical. Experience has shown, however, that losses from weathering, leaching and caking; the wasteful spreading of lumped salt; the delays and difficulties of breaking up the surface crust; and troubles with spreading machines exceed the amortization costs of storage sheds. Similarly, covering outdoor salt piles with tarpaulins or vinylite plastic sheets can be shown to be costlier and less dependable than permanent sheds.

The program for salt storage in the City of New York was developed to take advantage of bulk shipments and portable crane unloading into dock side, silo type tanks for primary storage at four critically situated sites. The tank construction permits gravity discharges into transfer trucks and salt spreaders. Secondary storage for servicing tributary areas is to be provided in nine sheds having light steel superstructures resting on a combination retaining wall and footing. The sheds have an 80-foot span, clear height at center of 26 feet and lengths of 100, 150 and 250 feet to store from 4,200 to 9,500 tons each. Large doors per-



● **PROPOSED primary storage silo holds 4,000 tons of salt; is loaded by mobile crane with 60-ft. boom. Stilt-like foundations permit gravity discharge to trucks.**

mit entry and loading of salt—front-end loader to salt spreader—from each end of the stockpile. The cost of this program is estimated at about $10 per ton or 35¢ per cubic foot of salt volume for the required 80,000 tons.

Caking—Rock salt is deliquescent and absorbs moisture which partially dissolves the outer surface of each crystal. Periodic dehydration recrystallizes this outer solution, bonding the adjoining particles. The degree of moisture absorption and solidification is dependent in part on exposure. Large outside stockpiles exposed to humid conditions develop a thick hard surface caking, while interior stockpiles under relatively dry conditions develop thinner semi-hard surface caking. Experimental storage in concrete silos gave a free gravity discharge after a few days storage but after 4 months winter storage there was caking.

The basic solution lies in coating the salt particles with either an insulating or a moisture absorbing film. Oil sprays were rejected for obvious reasons. It was decided to test the merits of admixing several types of hygyroscopic chemicals. Those considered were magnesium carbonate, calcium silicate, corn starch, Celite 379, silica gel, and Banox. Two sets of tests were made: small-scale tests with 12 months storage in 50-gallon drums; and large scale tests with four 500-ton abandoned coal silos of reinforced concrete. As a result of these tests, it was concluded that of the chemical admixes tested, silica gel gave the most consistent and dependable results. The rat and vermin hazards of storing edible starch and the dust conditions in its admixing negated against its usage. Magnesium carbonate was ineffective and calcium silicate not very much better.

Corrosion Problems

Action on Concrete — Structures and pavements of concrete deteriorate from a number of causes. Too often these causes are overlooked and the blame is placed on occasional salting. Damage from salt is relatively minor, affects only inferior concretes and is correctible.

The corrective steps advocated are: For old concrete, covering exposed surfaces with a protective sealing agent; and for new concrete, using air entrained cements. Protective treatments recommended by the Portland Cement Association consist of coatings of magnesium or zinc fluosilicates, boiled linseed oils, or Cummar (a synthetic soluble resin). Use of air entrained cements in new concrete produces a cellular, spongelike mass which absorbs the expansive forces of the recrystallized salt.

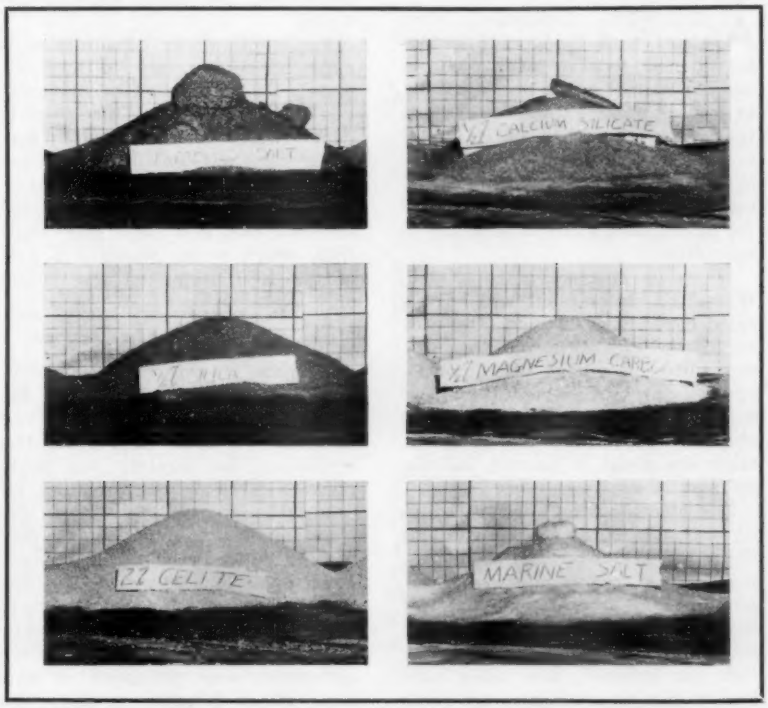
Steel Corrosion—Too often when surface and sub-surface metals are corroded rock salt is blamed. It has been well established that most of the corrosion of automobile bodies occurs in the inaccessible, unprotected surfaces within the hollow doors, and in the contact areas between metals. This is due to excessive dampness. Similarly the corrosion of underground metal conduits and structures is frequently the work of stray electrical currents and electrolytic action, but often is blamed on salt brines.

It was decided to conduct extensive field tests for two winters in three Sanitation Districts, one without salt applications; one with salt usage; and one with a one percent admix of a rust inhibitor. Sets of 3″ x 3″, 20-gauge, mild steel panels were attached under 25 Department of Sanitation trucks in each test area; 60 more were placed in subsurface transformer vaults; and another 10 were fixed on garage roofs for control purposes. Each panel was weighed before mounting and then reweighed at the end of the winter after proper cleaning. The winter of 1951-52 had 10 "salt" storms and a total precipitation of 14.4 ins. The 1954-55 winter had 9 "salt" storms and a total precipitation of 10.9 ins. A summary of the test results follows:

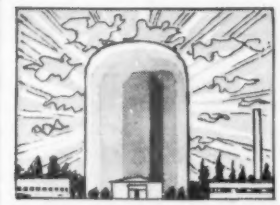
The control panels showed a weight loss of 11.0 percent; the truck panels in the unsalted area 3.1 percent; the truck panels in the salted area 14.0 percent; and the truck panels in the area where the inhibitor was used 4.5 percent. The transformer panels, on the same basis, were 12.1, 14.6 and 14.9 percent.

The inconclusiveness of these data may be due, in part, to difficulties in maintaining the truck panels clean and exposed to corrosion, and in part in maintaining field controls of the truck operations. To satisfy the Utility Companies, a second test was conducted on 40 transformer vaults, 20 in salted and 20 in non-salted areas. The results were: Atmospheric exposure 4.1 percent loss of weight; non-salted 10.6 percent; and salt-treated 8.6 percent.

The atmospheric corrosion was greater in this instance because of increased humidity and moisture conditions in the sub-surface vaults. It would appear from the latter test that salting was beneficial rather than detrimental to corrosion—in any case it did not prove the ogre that it's usually pictured to be.



● **COMPARATIVE appearance and shape of piles of untreated salt and salt with hygroscopic admixes after 12 months indoor storage test in open drums.**



GROWING POPULATION

DEMANDS A MODERN WATER SYSTEM

PHIL HIRSCH

A GROWING population, combined with inadequate capacity to meet existing peak demand, has led Wilmette, Ill., near Chicago, to embark on an extensive rehabilitation and expansion of its water system. The project is particularly interesting because space for processing raw water was limited, and the new facilities had to be designed accordingly.

When the project is completed, Wilmette's water plant will have a rated capacity of 15 mgd. The area served includes corporate Wilmette, the adjoining village of Glenview, and the nearby Glenview Naval Air Station. Wilmette presently uses about 58 percent of the pumpage, Glenview about 33 percent, and the air station the remainder.

The plant's original design capacity was approximately 6 mgd. This figure has been exceeded often during the past few summers; even so, pumpage has been unable to meet the demand at times. As a result, the efficiency of the filtration operation has suffered, and users have had to put up with an inadequate supply, rationing, and other discomforts. Without expansion of the waterworks, this problem was bound to grow worse.

By 1980, Wilmette is expected to have a population of approximately 28,300, according to a study conducted by Alvord, Burdick and Howson. Glenview's 1980 population will approximate 18,900. At the time of the survey, Wilmette's population was 20,130, and Glenview's was 11,050. The Naval Air Station population represents a relatively small demand factor, and was ignored in calculating the future capacity required.

Per capita water consumption is expected to increase to approximately 125 gal. in the two communities by 1980. In 1954, Wilmette residents were consuming 118 gpd, while those in Glenview were using 124.9. (The individual consumption figure for Glenview has oscillated between 88.8 and 124.9 gals. since 1945, which is the reason this part of the 1980 projection was raised only slightly).

Maximum Usages

Wilmette's refurbished waterworks is designed to meet the demands of the village and its two customers at least until 1980. The maximum day domestic and commercial demand (the area has no industry) expected at that time was obtained by analyzing maximum-to-average-day pumpage ratios during the previous 20 years. This was approximately 2.4:1 and was the ratio used in designing the plant—i.e., the maximum day pumpage requirement was estimated at 15.2 mgd, which is equal to about 2.4 times the average day pumpage of 6.35 mgd, expected in 1980.

Besides a peak demand of 15.2 mgd, the new water system must also provide a fire reserve of 7.3 mgd by 1980. The fire reserve, based on population, is figured on the standards of the National Board of Fire Underwriters which require that a water distribution system be capable of filling both the peak demand and the fire reserve requirement for a period of at least 10 hours. In the case of the Wilmette system, this means the capability of supplying 9.4 mg during the 10-hr. period. Here's how the water can be supplied:

The filter plant will process 6.25 mg. An additional 2.8 mg will come from two clearwells, one of them built as part of the present expansion project, the other already in place on the suction side of the high-lift pumps. Storage facilities in the distribution system (an elevated tank and standpipe) will provide another reserve amounting to about 4.4 mg. Thus, to meet the 10-hour maximum demand there will be a total of 13.45 mg available.

Because of the limited capacity of the present filter chambers, mixing and settling basins, it has been necessary to ration water in both Wilmette and Glenview for the past four years during the peak-demand summer months. Even with rationing in effect, processing time has had to be cut from the normal four hours to as little as an hour and a half. Under these accelerated flow conditions, the filters had to be cleaned as often as every two or three operating hours.

Filter wash water formerly was discharged either to a nearby 15-in. sanitary sewer, or to Lake Michigan (the plant is located about 300 ft. from the shoreline). But discharging water into the sewer took three hours, too long during peak-demand periods. And when the lake was used, there were complaints from Wilmette residents who swim in the area.

It is expected that construction of a new wash water discharge line feeding into the sanitary sewer, together with additional filters, mix-

ing and settling basins will eliminate these problems. When the new facilities—now almost completed—are placed in operation, the plant will be able to process up to 15 mgd without having to wash the filters.

The original installation consisted of four mixing chambers, two two-chamber settling basins, and four filters. The mixing basins were fed from a 20 and a 14-in. discharge header, both of which came from three low-lift pumps. Water flowed in series through all four mixing basins, then through an open conduit and 30-in. gate valve into two around-the-end type settling basins. These were connected to the filters by a 30-in. header. After filtration, water flowed through a 30-in. collector pipe to a 1.3 mg capacity clearwell, and from this well to the high lift pumps and the distribution mains.

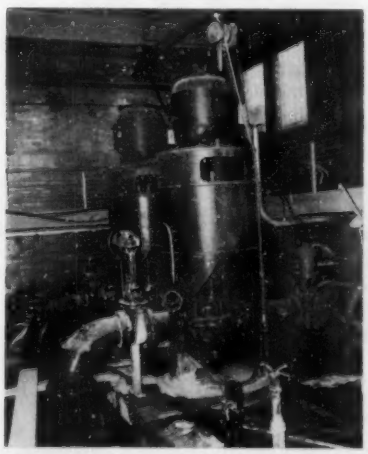
Each of the four original filters processed 1.5 mgd under standard conditions—i.e. when passing 2 gals/sq.ft./min. Each measured approximately 20 ft. by 27 ft. long. The filter bed consisted of a 27-in. layer of sand, plus four layers of larger graded aggregate having a total depth of 8 in.

The mixing and settling basins have a combined capacity of 1 mg. The former are 25x14 ft., and 17 ft. deep; the latter are 17 ft. deep, 24 ft. wide, and 100 ft. long. Each mixing chamber is equipped with a Universal Gear mixing unit rotating a double-bladed paddle.

To these original filter facilities, three new filter beds have been added which will provide an additional 9 mgd of capacity. Previously, during peak demand periods, the original filters had to process up to 3 gpm per sq. ft. of filter area, permitting the plant to produce raw water at rates up to 9.6 mgd. With the additional filtering capacity, it will be possible to handle 15 mgd at a rate of 2 gals./sq.ft./min.

The filters were previously washed by a 13,900-gpm (35-ft. head) pump discharging through a 24-in. line. The wash water then flowed into an 80,000-gal. cistern. From the cistern, wash water was sent through an 8-in. discharge line to the lake, or to the 15-in. sanitary sewer, by a 750 gpm sump pump.

The 8-in. line has been replaced with a 12-in. line, and an Allis-Chalmers discharge pump, rated at 2780 gpm, has been installed in place of the 750 gpm unit. Also, a second wash water cistern has been built, with a storage capacity of 100,000 gals. This installation will make it possible to discharge the wash water from all seven filter beds in less than an hour.

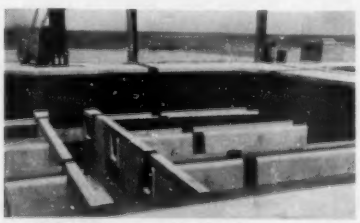


● **MOTORS were elevated on these A-C pumps to avoid flood damage. Pumps are of 5560 and 3475 gpm capacity.**

Mixing and Settling

Raising the plant's rated capacity from 6 to 15 mgd also required installation of two new settling and two new mixing basins—each of the latter consisting of four chambers. To facilitate floc formation, each mixing basin was made an integral part of its corresponding settling basin—i.e. the mixing basin was placed in the return flow pass of each settling basin.

Each of the new mixing-settling basin installations is a two-story affair. Mixing, and the second half of the settling operation, are conducted on the upper level, while primary settling takes place on the lower level. One advantage of this design is that it practically eliminates the possibility of short-circuiting which was possible at high flow rates, with the around-the-end type settling basins, according to Armand Lund, Wilmette's Superintendent of Public Works.



● **NEW filters, shown here, will increase capacity from 9.6 to 15 mgd.**

The design used also is less expensive to construct—mainly because of the reduced amount of excavation required—and requires less land area. Mr. Lund estimated that approximately 8,000 sq. ft. less plant area were required, a saving especially important in Wilmette's case, since virtually all the land on which the new mixing, settling, and filtering facilities are being built had to be acquired.

A common low-lift discharge line carries raw water to both the new and old mixing-settling-filtration areas. This 30-in. line replaces the 20 and 14-in. headers that previously connected the low-lift pumps with the original mixing basins. The input into the new mixing basins is through two concrete influent ducts, each of which measures 2½ ft. high and 4 ft. wide. After mixing, the raw water passes through ports in the floor of the mixing chamber into the primary pass of the settling chamber below. Traveling the length of this chamber, the partly-clarified water then flows through ceiling ports into the upper or return-flow section of the settling chamber. The water then enters a transverse effluent duct and is transferred in a closed duct to the end of the basin structure, then by pipe to the filter gallery.

The two sets of mixing-settling basins, which are operated in parallel off the common 30-in. low lift discharge line, are built alongside each other. Each primary settling basin—the structure on the lower level—measures 119 ft. long, 55 ft. wide, and 8½ ft. deep. The upper-level basin structure has the same length and width and is about 9½ ft. deep. This latter basin is divided approximately in half; mixing is accomplished in the chamber closest to the input end of the structure, and the return-flow pass of the settling basin occupies the remainder.

Besides the 9-mgd. increase in filter bed capacity, and the new mixing and settling basins, a second clearwell has been added to provide additional reserve for the high-lift pumps during heavy-demand periods, and for fire-protection purposes. The new basin which measures 115 x 138.5 x 14 ft. deep, holds approximately 1.5 mg.

Handling Chemicals

Another major improvement involves the system of handling mixing basin chemicals. Chlorine and ammonia previously were fed from 150-lb. cylinders; two chlorinators and two ammoniators, all manufactured by Wallace and Tiernan, being used. Alum and carbon were emptied into Omega feeders. All four items were delivered at pumphouse floor level (elevation plus 4.5, Wilmette Datum), and were then

(*Continued on page* 142)

DIESEL-GENERATOR CAPACITY ROCKETS

to Match VERO BEACH GROWTH

CHARLES C. JEWETT,
City Manager,
Vero Beach, Florida

A CAPACITY increase of 500 percent within the past five years is the record of expansion at our municipal power plant in Vero Beach, Florida, which has undergone a spectacular growth in population. The required plant expansion has been achieved by the installation of three Nordberg diesel engines with a combined capacity of 16,100 horsepower.

The City acquired a 35-kilowatt power plant in 1919. The original units were supplanted in 1920 and '23 by 71-kw and 212-kw prime movers respectively; and they in turn were replaced with a 525-kw air-injection diesel in 1926 and a 753-kw diesel in 1937. These two units met the city's needs for ten years and are still in service. In 1947, a four-cycle supercharged diesel which drives an 1150-kw generator was added. In three years, peak loads reached plant capacity and the City had to purchase power to meet the demand. A 4050 horsepower (2875-kw) diesel was ordered, but before this was ready, Nordberg was able to meet the emergency by diverting to Vero Beach a 4500-hp engine. This two-cycle, 10-cylinder diesel was placed in operation in 1952, driving a 3200-kw Elliott generator.

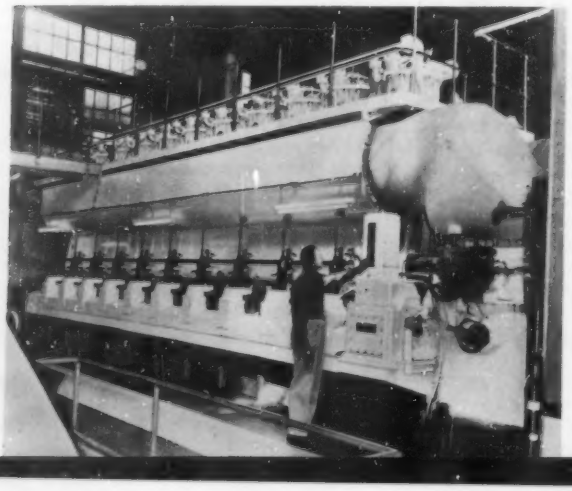
The following year, the originally ordered 9-cylinder Nordberg diesel was put into service, adding another 2875-kw to plant capacity and, for the first time in years, the City had the protection of firm capacity. However, peak loads continued to climb and even the addition of the two engines with combined capacity of 6075-kw, did not meet the demand for long. As a result of studies by Consulting Engineer Harry W. Damerow, it was decided to purchase an even larger unit. This will be a two-cycle Nordberg diesel, rated at 7550 bhp. It will operate on diesel fuel until natural gas becomes available in Vero Beach and then will be converted to a Duafuel unit. It will drive a 5400-kw Elliott generator and will raise total plant capacity to 13,925 kilowatts, more than five times the 2450-kw capacity of five years ago.

Not only are all capital expenditures financed by plant revenue bonds, but the electric department continues to transfer substantial profits to the City general fund. In the fiscal year ended June 30, 1956, the Electric Department had gross revenues totaling $707,966 and a net revenue of $322,249. Due to the accelerated growth of the City and the increased kilowatt hour use per family, it is expected that net revenue will top $500,000 a year by 1962.

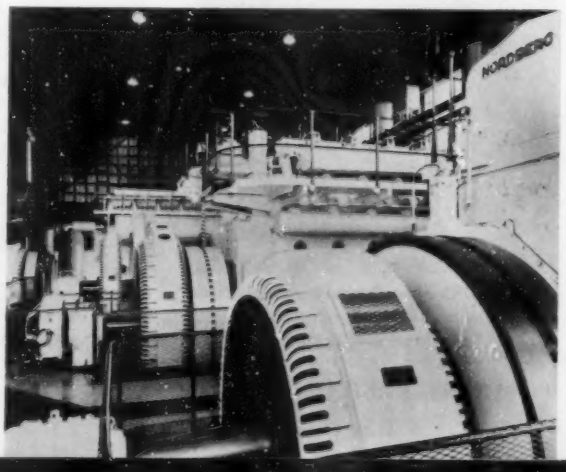
The municipal power plant is operated efficiently under the direction of Superintendent Fred Gossett. Pressure for economy is great since this plant uses a relatively expensive fuel, a distillate oil costing 11.65 cents a gallon. Superintendent Gossett and the plant operating staff do all their own maintenance, keeping complete records. There is a separate card for each piston, bearing, cylinder liner or other major wearing part. It lists the make of the part, measurements, work done, time spent, personnel making repairs, and condition. To increase personal interest in the work, each operator has the primary responsibility for one engine. The appearance and performance of the plant show that this policy pays off.

The City has striven to even out the load as much as possible and has succeeded in filling in summer valleys to some extent with air conditioning load. Most residents feel the Vero Beach climate too mild to justify central heating equipment, but electric space heaters are becoming increasingly popular to take the chill out of an occasional winter evening. When the mercury dips and the heaters come on, load on the plant increases as much as 2,000 kilowatts.

● **AT THE controls of the 4500-hp diesel, base load unit, Superintendent Fred Gossett checks Vero Beach power plant.**



● **MORE power will be added. In addition to engines shown, new 7550-hp unit will be placed in a space at the far end.**



TWO-WAY RADIO
In COUNTY HIGHWAY WORK

MARION WILKINS,
Engineer, Conecuh Co., Ala.

WITH AN AREA of about 850 square miles, Conecuh County, Ala. has about 850 miles of county roads. Over 200 miles of these roads are paved and we average over 30 miles per year of paving with necessary bridges. It should be said that our paving consists of a minimum of 6-in. sand-clay or clay gravel base course with a double bituminous surface treatment or plant mix surface. Minimum paving width is 18 ft. with a 24-foot roadway. This type of construction is very satisfactory for this county and climate.

In the road department we have in addition to five regular maintenance crews, a construction section, a bridge construction unit, a paving unit, a basing unit, engineering and soil analysis section, and equipment maintenance shop. Evergreen, the county seat, is centrally located in the county. The most remote point is 30 miles from the road department plant as the crow flies with 90 percent of our activities within a 15-mile radius from Evergreen.

With improvements in our road system growing at a rapid pace it became necessary to consider ways and means of reducing cost, speeding work, overcoming shortages in skilled man power and making best use of county owned heavy and light equipment. To fill the need for better communications, our road department, in 1955, purchased a two-way radio system consisting of a base station and eight mobile units all of the 60-watt class. The base station was installed in the office of the County Engineer so arranged that it could be operated conveniently by the clerk. A 100-foot tower was erected with a ground plane antenna adjacent to the Engineer's office. At the same time three monitors were purchased, two on our frequency installed in the local State Highway Patrol radio room and in the Court House and one on the Highway Patrol frequency installed at our operating position. This arrangement supplied radio communications with the State Highway Patrol for use during emergency when civil defense services need be coordinated with the Patrol and State Civil Defense Headquarters. We also have portable power plants to operate the base station during power failure.

Radio Cost Data

In 1956 the two-way system was augmented by the purchase of 10 additional 60-watt mobile units and one hand carried portable set. The mobile units are installed in the Engineer's car; Assistant Engineer's car; all inspectors' vehicles; superintendents' and foremen's pickups; in the shop service truck; and in the equipment transfer truck-trailer. Every working unit has two-way radio communications.

The overall cost of this entire system was approximately $10,000. By cooperating with the Civil Defense Department the Federal Government paid one-half of this amount leaving a net cost to the county on the base station, 18 mobile units, one portable unit, portable power plant, and monitors of $5,000. The average cost to the county of each of the 23 radio units, including associated equipment, is approximately $217. The base station of course cost more than the smaller units, but this is a good figure for an overall system of about our size.

To figure the monthly operating cost to the county for an individual unit a period of 15 years can be assumed for the life expectancy. This amounts to 180 months of useful life of each unit. By prorating the initial cost over the 180 month period the cost of the average unit to the county is $1.20 per month. It is easy to justify the cost of the system on this basis since there are many days each month in which the monthly cost is saved several times.

Looking further into the cost one must consider the maintenance and installation cost of the system. The County Engineer, your author, is the holder of a 1st class Radio Telephone Operator's license. It is a requirement of the Federal Communications Commission that only a person qualified as a 1st or 2nd class Radio Telephone Operator may perform installation and service on such Communication equipment. Therefore the cost to Conecuh County for installation and maintenance is reduced to the cost of replacement parts as needed. Most commercial two-way radio equipment is so well constructed that very little in replacement parts is required. In our two-year experience with this system the replacement parts cost has been less than

$4 per year and this consists mainly of tubes. Adding this to the cost figure of $1.20 per month brings the monthly cost to approximately $1.53. This figure of course does not include the service cost which is being done by the Engineer at no additional cost to the county.

Since we do not require and pay for the maintenance service cost we are not familiar with that cost. Service is usually performed at a rate of $5 per unit per month, however some systems are serviced on a call basis only. It is easy to see that maintenance service can easily be over three times the actual cost of this equipment and maintenance parts. This is a very important point and must be given primary consideration in planning a system. An organization that has a licensed technician in its regular employ can easily perform this maintenance in a system of our size.

Use in Maintenance

After our equipment was placed in operation it became indispensable in the maintenance and construction of our road system and in the administration of the department. In time of emergency the radio becomes an important tool available for communications as needed by our Civil Defense organizations in routing traffic, keeping roads open and replacing normal communications if they become inoperable. During and after storms we are able to clear roads much sooner and make repairs more quickly.

When a piece of equipment breaks down, a service truck is on the way in a few minutes with necessary parts or the equipment trailer is on the way to haul the equipment to the shop. If necessary, we have replacement equipment on the way in a short time. Shop mechanics have been able to advise immediate steps by radio to operating personnel to repair the equipment and place it back in service.

The engineer is always available to superintendents and inspectors to interpret plans and render decisions so that work progresses with undue delay. Through the inspectors and the radio, the engineer is always in direct contact with construction work.

Through instant communication with the paving unit, the paving superintendent can have materials ordered out and deliveries scheduled closely with prosecution of work. This eliminates much idle time and many overtime hours in planning work immediately ahead. We have found that labor crews can be shifted about the county to the point needed. This, of course, eliminates the need of keeping a crew of men always on hand for those irregular jobs, such as handling materials, pouring concrete, laying pipe culverts, etc. Labor crews are called off their regular work for these jobs and are sent back to their usual work when no longer needed for the special jobs.

The survey party is always instantly available from its regular location and survey work to check or set construction slope stakes, stake out drainage structures, restake lost points, give centers and elevations to the bridge superintendent, and assist in the many jobs on which the engineer is called. We have made another very important discovery for two-way radio in overcoming the shortage of engineering personnel. No longer does the party chief have to go to the field with his survey party. The party chief remains in the office, working on the preparation of plans and assisting in other work. The survey party goes ahead with routine work but, when necessary, the party chief can, by radio, make necessary computations, compute curves, grades, etc., on the computer. He can also make decisions as to location procedures and exercise general supervision via the radio. For the first time in my experience with county road work, we are not behind with survey and plan work. Two-way radio is not solely responsible for this, but has been one of the greatest factors.

Radio helps in personnel and administration. Any foreman or superintendent may be called at any time by our clerk for information on employees, progress reports, estimates and payrolls. We have found that instant communications between the various crews has developed more interest and cooperation in the work. When one foreman hears on the radio that another is having trouble or needs assistance, he will offer help immediately. Never before have we had such cooperation among all employees.

One of the most important advantages of the two-way radio is when a constituent calls upon his road commissioners or engineer, either to ask a personal favor or report a bad road condition. In many cases this request or report has been taken care of before the constituent can return to his home. When this happens, the taxpayer recognizes the importance of two-way radio.

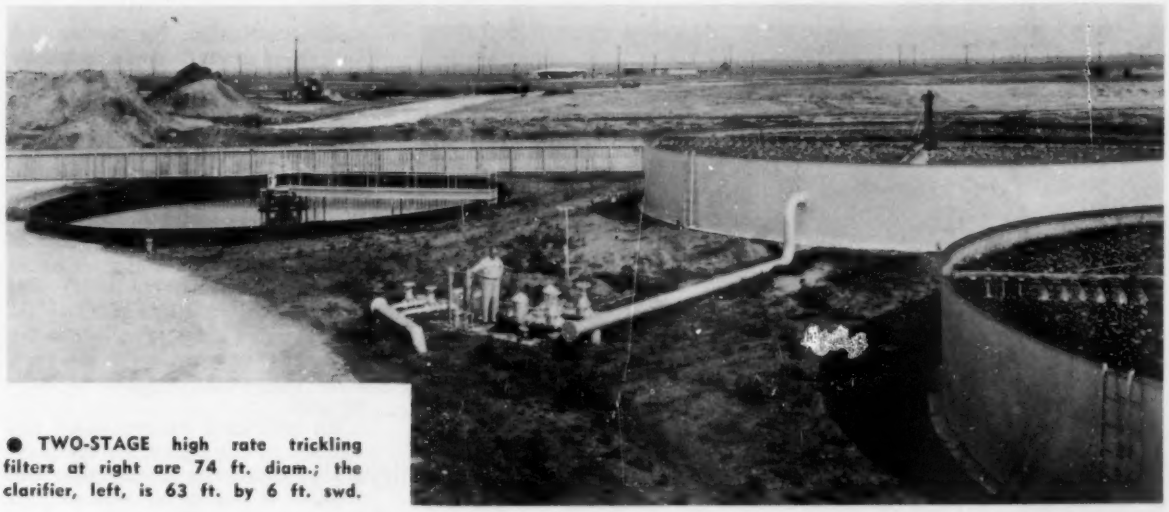
The one person benefited mostly by the two-way radio in the County Road Department is the Engineer. With it he can be everywhere at one time. He can save countless miles and hours of driving thereby, spending more of his time directly on engineering work. He can follow through on instructions to subordinates. He can be readily available when called upon by superiors. He is always in instant communications with the office or the construction job even though he may be in the most remote section of the county.

Soiltest Mobile Testing Laboratory

A MOBILE laboratory, completely equipped for the use of soils, agricultural, concrete and materials engineers, was exhibited at the Fall meeting of the New York-New Jersey Metropolitan Chapter of the APWA by Soiltest, Inc., Chicago, Ill. Built into a spacious trailer, the laboratory on wheels provides apparatus and supplies for making tests on such projects as highways, airfields, levees, irrigation works, earth or concrete dams and general earthwork construction. A generator set furnishes power for lighting and operation of equipment. The mobile lab is air conditioned.

● INTERIOR of mobile soils lab.

The particular unit on display at the APWA meeting was enroute to Iraq, where it will assist in that country's highway expansion program. Similar units equipped by Soiltest are being used by highway departments in the United States to fill the needs of the testing engineer in the field.



● TWO-STAGE high rate trickling filters at right are 74 ft. diam.; the clarifier, left, is 63 ft. by 6 ft. swd.

USE OF STEEL
IN SEWAGE PLANTS CUTS COSTS —SPEEDS CONSTRUCTION

ROBERT M. MILLWEE, JR.
Millwee and Associates,
Consulting Engineers
Bellaire, Texas

IN STUDYING the present and future requirements of a sewage treatment plant for a new and rapidly growing residential subdivision, it was concluded that to build the plant primarily of steel offered several advantages over the conventional sewage treatment plant construction.

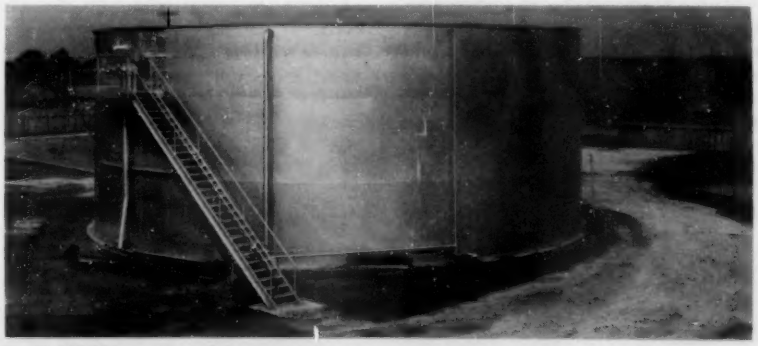
The new plant was built and is operated by the Harris County (Texas) Water Control and Improvement District No. 49 in Westbury, a new home development southwest of Houston. Ultimately the community will contain 6,000 homes, housing approximately 20,000 persons. The plant is designed to serve all future needs of the community.

The treatment process used in the Westbury plant is a conventional two-stage trickling filter design. Preaeration is used ahead of the primary sedimentation unit to aid in removing septicity from the incoming sewage and to create a more settleable floc in the primary.

The primary sedimentation unit is 13 ft. high and 45 ft. in diameter and employs the Process Engineers Oxidator unit for preaeration and sedimentation. The trickling filters consist of two tanks 7½ ft. high and 71 ft. in diameter equipped with Walker Process rotary distributors. The final sedimentation unit is 8 ft. high by 63 ft. in diameter and is equipped with a Process Engineers collector mechanism. The digester is 23 ft. high by 60 ft. in diameter. All tanks are made of ⅜-in. steel plates. Tank sections are joined by butt-welding. Tanks are protected on the interior by an inert coal tar derivative and on the outside by red lead primer and a green finish coat. Tanks were fabricated and erected by Chicago Bridge & Iron Company.

Cost of construction on the Westbury plant was $235,000. Construction time was approximately six months, with delivery of equipment being the deciding factor. An interesting sidelight is that an unusually wet spring and summer in the Houston area did not slow down the Westbury job.

In fabrication erection of the steel tanks, the same procedures were followed as are normally used in



● DIGESTER, with capacity of 58,000 cu. ft., is 60 ft. in diameter and 20 ft. high. Stairway leads to supernatant drawoff box shown on upper portion of shell.

● AERIAL VIEW of the sewage plant at Westbury, Texas, shows the five major treatment units in which steel plate was used for construction of the tank walls.

connection with elevated steel water tanks and ground storage tanks. In all these cases, detailed inspection is provided by the fabricator. X-ray, hydrostatic and mill test assure the engineer of the quality of the work.

A real advantage to the engineer is the simplicity of design allowed by the use of steel. The primary tank, as in the plant at Westbury, can be elevated to provide adequate hydraulic head through the first stage filter and at the same time provide above-natural grade construction. The fact that the contractor does not have to make extensive excavations contributes a great deal to the overall economy of all-steel construction. Too, filters can be placed above ground, making them readily accessible for cleaning and maintenance. The above-grade construction also permits full gravity flow on a single filter plant and only one intermediate lift station on a two-stage trickling filter plant, such as this one.

It was in the digester design that we could take full advantage of steel construction. By placing the unit above ground, ample hydraulic head is available to insure that digested sludge can be placed on the sludge drying beds. When sufficient hydraulic head is available, the sludge drying beds need not be placed too deeply in the ground. Welded steel construction of the digester makes possible the design of a rigid roof of sufficient strength to withstand considerable uplift and maintain only a slight pitch to allow digestion gases to collect in the dome at the center and at the same time keep scum formations submerged.

An additional constructional advantage of using steel for the plant is that all interior wires, baffles and troughs as well as all exterior piping, walkways, ladders and stairs can be attached by welding. Finished units are easy to sandblast and paint. There are no hidden surfaces under bolts and brackets.

Project engineers on the Westbury sewage disposal plant were Hilton and Coulson, Consulting Engineers, Houston, Texas, with Robert M. Millwee, Jr., Consulting Engineer, of Bellaire, Texas, serving as consultant and designer of the plant. The prime contract was handled by M. E. White, Inc., general contractor, and the steel subcontract by Chicago Bridge & Iron Company.

Erecting Composite Steel-and-Concrete Bridges

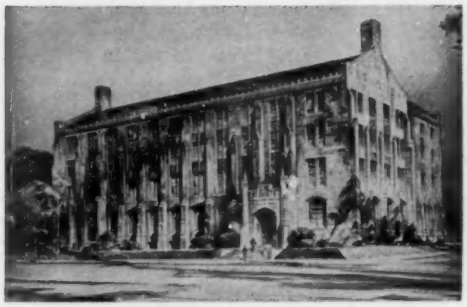
THROUGH use of stud shear connectors, end welded in the field, the shear developers for decks of composite steel - and - concrete bridges in Michigan are being erected at least 25 percent faster than formerly.

In the first use by the Michigan state highway department of studs as shear connectors, approximately 8500 Nelson headed studs, ¾-in. diameter by 4 inches long, were end welded recently to the beams of a bridge just completed at Farmington. The studs bond the steel beams and concrete slab together so that they act as a unit and reduce the amount of structural steel required in the bridge.

Studs were end welded in rows of four on approximately 3-inch centers across the flanges of the bridge girders. Rows were 15 inches apart on girders at both ends of the bridge and 18 inches apart in the center girders. The Farmington bridge included three 53-ft. long spans, each span having nine girders. Approximately 2,750 studs were welded on each span. Average speed for each of two operators using Nelson NS-9 stud welding guns was four studs per minute.

● ABOVE: Operator of Nelson stud gun end welds one of the 8500 headed shear connector studs used to fasten concrete deck on a composite bridge. At left: Checking a finished section.

APWA News BULLETINS



AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Record-Breaking Public Works Congress Spotlights Urban Problems

Philadelphia, Pa.—The 63rd annual meeting of the American Public Works Association held in Philadelphia, Sept. 22-25, shattered all previous attendance records and featured the largest equipment show ever sponsored by the Association. Over 2,200 members and guests from virtually every part of the United States and Canada were in attendance. Visitors also came from such far-away points as Edinburgh, Scotland and Dunedin City, New Zealand.

Highlights of the annual dinner were an address by Dr. Henry T. Heald, President of the Ford Foundation, and the presentation of awards. Twenty-eight members of the APWA received the Samuel A. Greeley Service Award, which is annually presented to persons who have completed 30 or more years of continuous service with the same municipality. The Charles Walter Nichols Award with its $500 honorarium, for outstanding achievement in the broad field of sanitation, went to Michael A. Groen, Superintendent of Sewage Treatment, Dearborn, Michigan. The award was presented to Mr. Groen for his service in developing a practical solution to a serious sewer damage problem by devising a means for utilizing steel mill acid wastes — previously discharged into the sewer system—in the conditioning of sewage sludge.

The 1957 Engineering News-Record Aid-to-Education Award of $1,000 went to Norman R. Bennett, who is a senior civil engineering student at the University of Akron. Honorary memberships were presented to Carl Schneider, Consulting Engineer of New Orleans, La., and to C. W. Nichols, Sr., an outstanding industrialist of New York City, who has been a faithful supporter of the Association for many years. A Life Membership was also presented to Frederick Galloway, former Superintendent of Public Works, Montclair, N. J., who helped to organize the New York-New Jersey Metropolitan Chapter of the APWA.

Two Speakers at '57 Congress

Dr. Heald

Mayor West

An attractive plaque was presented to the Association by John T. Soltmann, Executive Vice President, Keep America Beautiful, Inc., in recognition of "Distinguished public service as pioneer leaders in the coordinated educational movement to stimulate individual responsibility and pride in clean, safe, healthful and attractive communities throughout the nation." Paul Screvane, Commissioner, Department of Sanitation, New York, N. Y., and Wm. A. Xanten, Superintendent of Sanitation, Washington, D. C., received individual awards of merit in recognition of their contributions to the success of the KAB program.

The Urban Problem

Dr. Heald, in his address to the membership, noted that American cities are deteriorating faster than they are being renewed. He went on to point out that this is the time to tackle the urban problem. "The shortage of tested knowledge and trained people," he said, "is perhaps the most overlooked and acute of the fundamental elements of community development. The Ford Foundation has sought ways to help civic organizations and public officials think through and mount attacks on the basic problems of urban development . . . We believe in investing money in good people and in good ideas—and in helping to produce good people who can produce good ideas. Our nation can be only as strong as the knowledge and wisdom of its people and it is education, we believe, that produces these qualities.

"It is at the grass-roots level of government that local officials face the greatest challenge—the greatest opportunity for leadership, too. The problems that face the units of government you serve figuratively scream out for attention and leadership . . . If these challenges are to be met, it will be through the achievement of people such as you

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—the working corps of America's public servants—and the public-spirited citizens all over the nation who stand at your side."

At one of the general sessions, Ben West, Mayor of Nashville, Tennessee, and President of the American Municipal Association, gave a hard hitting talk on the "Fight for the Rights of Urbanites." Mayor West explained that the urbanite knows that he cannot go to Washington with his individual problem, and that the odds of his obtaining the ear of his State Officials are overwhelmingly against him. "To whom does he turn? He goes to the elected official most accessible to him, the representatives of his local government, his councilman, his alderman, his mayor. His problem will eventually get to you . . . Yes, you will be in the front lines of any battle for the urbanites."

He called for better representation of the urbanite in our State legislatures, and said, "The city man is, as a matter of fact, better represented in Washington than he is in his own State Capital." Mayor West also said that there would be very little city-federal relations if the States had assumed their rightful responsibilities. He also took note of the shortage of public works engineers and called upon local governments to wage a fight to insure that they reach and retain a competitive position with industry for the services of engineers, both salary-wise and in terms of fringe benefits.

Donald M. Oakes, City Manager, Grand Rapids, Michigan, explained, in his talk on "Development and Administration of Municipal Policies," that "communication" is perhaps the most important element in a smooth-working organization. He suggested that public works administrators should point up problems in the clearest light possible so that elected officials and their constituents will have all the necessary information for intelligent action.

Hugh Pomeroy, Director of Planning for Westchester County, New York, discussed the "Evolution and Transformation of Cities," and Charles Wedekind, of the tree consulting firm of Edward H. Scanlon and Associates, made a plea for better selection and use of trees along our streets. He pointed out that numerous problems such as disrupted sidewalks, pushed-out curbs, overshading of lawns where it is impossible to establish or maintain grass or foundation plantings, the screening of traffic signs and street lighting, the clogging of sewers by tree roots, and the damage of utility lines, are created by the injudicious use of trees on city streets. Mr. Wedekind's illustrated talk also included many helpful hints on how to overcome these annoying and costly problems.

Streets and Highways

The Forum on Streets and Highways, presided over by Glenn Richards, Commissioner of Public Works for Detroit, featured several excellent talks. Alan Voorhees, Traffic Planning Engineer of the Automotive Safety Foundation, told the delegates that forecasters claim we will have 50 million more cars on our streets and highways within the next two decades. He outlined the procedures developed by the National Committee on Urban Transportation to help guide cities of all sizes conduct transportation studies and informed his audience that a new publication titled "Better Transportation for Your City," based on three years of work by the Committee and 175 experts in the field, is now at the printers and will soon be available for general distribution. George M. Shepard, Street and

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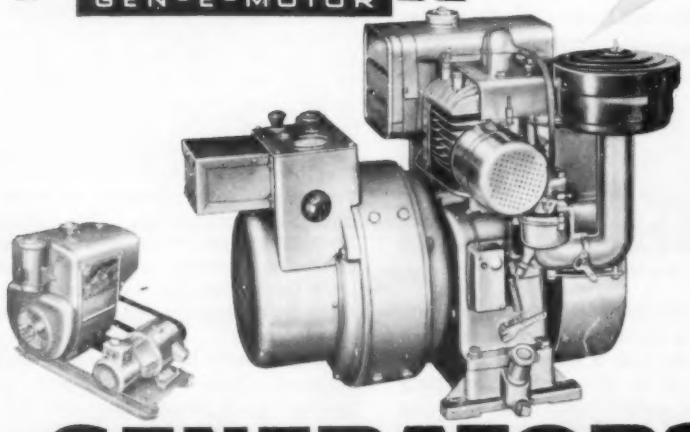

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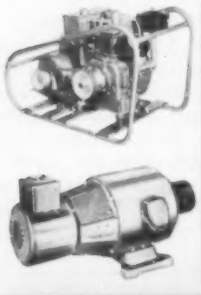

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Highway Coordinator for St. Paul, Minn., urged cities to develop well-planned programs for the acquisition of right-of-way to facilitate ROW programs and to lessen the relocation problems of individual families and commercial and industrial concerns.

George DeMent, Commissioner of Public Works of Chicago, told about the billion dollar, 76-mile expressway system now being built in the "Windy City" and said that rapid transit trains are expected to be in operation in the median strip on the West leg of the system by 1958. Perry Cookingham, City Manager of Kansas City, Mo., said that "Comprehensive, long-range budgeting that includes operation and maintenance requirements as well as capital needs is essential so that spasmodic efforts and unanticipated fiscal limitations will not adversely affect the understanding and confidence of the people and their elected representatives, nor delay the early completion of urgently needed highways." He also told the nation's public works leaders that the most important provision in the 1956 Federal Aid Highway Act is that calling upon the U. S. Bureau of Public Roads to determine the cost of providing the highways for the different classes of vehicles and/or types of users and the benefits derived from these facilities by the highway users. "This one study", he said, "may well influence the entire concept of financing of streets and highways, local as well as State and Federal, for many decades to come."

The Street and Highway Forum also included an informative talk on long-range street maintenance programming by Richard Gallagher, Director of Public Works of San Diego, California, who urged his colleagues to take another look at their maintenance practices and programs to see whether or not a little more effort and expense might not be more than returned by a marked increase in the useful life of their facilities. C. T. McGavin, President of Applied Parking Techniques, Inc., Washington, D. C., said that a "major downtown overhaul" is the only way for its survival as the dominant business center. He went on to point out that as late as 1949 there were only 75 shopping centers in operation, yet today there are 2,500 with about 500 more slated for completion this year. "The question of how well the tax-producing workhorse—the downtown business district—can withstand the new type of suburban competition depends upon how well the city government, downtown property owners and business establishments work together as a team to overcome key weaknesses before it is too late." Thomas J. Seburn, Associate Director of the Yale Bureau of Highway Traffic, explained that the function of a traffic control device is to either supplement or modify a rule of the road. "They are needed and used", he said, "to meet deficiencies in the street and highway system and should be properly designed, carefully placed, uniformly used and adequately maintained in order to serve their intended purpose." Harold E. Mason, Street Lighting Engineer for the City of Philadelphia, discussed the highlights of the street lighting modernization program in the Host City.

Forum on Sanitation

Paul Screvane, Commissioner of the Department of Sanitation of New York City, lead a lively discussion at the Sanitation Forum. William Gross, Director of Toledo's Department of Public Service, urged the delegates to do a better job of keeping the public informed of all the work that is constantly being done by their cities to meet street

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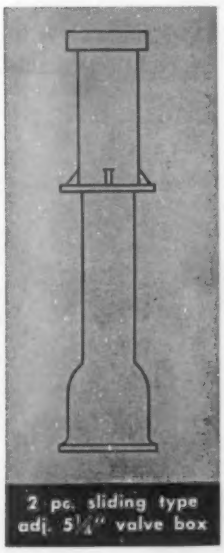

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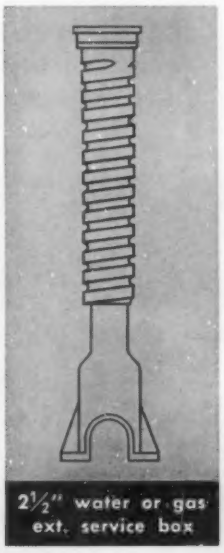

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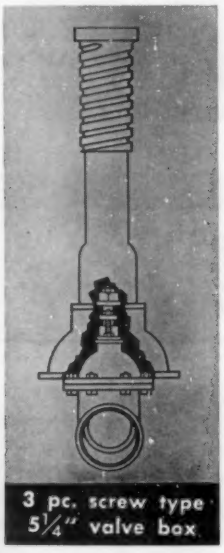

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cleaning, snow removal and ice control problems. "Volunteer Citizen Action Programs" were discussed by William Xanten, Superintendent of Sanitation of Washington, D. C.; Carl Walker, Director of Education of Detroit's Department of Public Works; Mrs. B. Lynn Adams, Executive Director of Yard Parks of Indianapolis, Ind.; and by Mrs. Walter Craig, Co-Chairman of Philadelphia's Clean-Up, Paint-Up and Fix-Up Committee. Mrs. Craig pointed out that no matter how many street cleaning employees the city has, it would never be clean unless the citizens, in general, have an interest in keeping the city clean. She also told about the fine work of the Police Department in organizing Junior Sanitation Squads in Philadelphia's school systems.

Stafford Graydon, Sanitary Engineer, Atlanta, Ga., told about a procedure followed in his city whereby all plans for multi-family dwellings and all business buildings must be approved by the Sanitation Department before a building permit is issued. This has been very helpful since it gives this department an opportunity to require easy access for refuse collection trucks and personnel at pick-up points. He also took issue with the view that it is more economical to have combined rather than separate collection of garbage and rubbish. "We believe", he said, "that separate trucks should be used to pick-up garbage and rubbish, and that different routings and different frequencies of pick-up should be used for these two classes of refuse." Morris Cohn, Editor of *Wastes Engineering*, in speaking of the development of household garbage grinding units, said "A few pioneering manufacturing firms serving this field have grown to a score or more; a few pioneering installations have increased to a million or more; a few scattered experimental units permitted by bold officials have grown to the point where garbage free communities are a matter of reality instead of wild predictions in the minds of those of us who forecast the elimination of the garbage can as an inevitable achievement in home sanitation and household comfort and convenience."

Wyandotte, Michigan's City Engineer, Louis H. Moehr, suggested that cities that encounter trench excavation problems in operating their sanitary landfills in the winter should excavate sufficient trenches in the Fall to provide dumping space until the frost leaves the ground in the Spring. He also suggested that

Thank You, Mr. Butts
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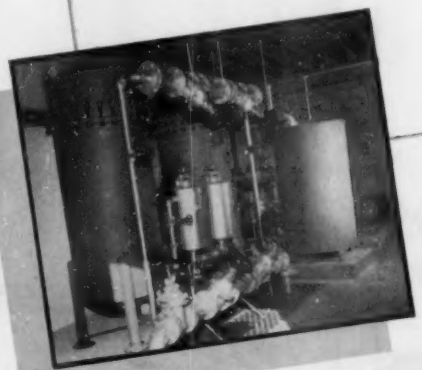

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leaves picked up in the Fall be placed over a proposed trench site in thick layers to prevent the ground from freezing prior to excavation. Abraham Michaels, Chief Sanitation Engineer for Philadelphia, described a proposed method of standardizing cost accounting procedures as they pertain to incinerator operation so that public works officials would have a more accurate basis for comparing incineration costs from one city to another. Wm. E. Ross, Superintendent of Sewage Treatment of Richmond, Indiana, described the central garbage grinding plant that was placed in operation in his city several years ago, and said that it has proved to be very satisfactory.

Water and Sewage

The Water and Sewage Forum conducted by Mr. Wendell LaDue, Superintendent and Chief Engineer of Akron's Bureau of Water Supply, proved to be one of the high spots of the Congress. Samuel A. Baxter, Water Commissioner for Philadelphia, said that there has been a tendency to belittle the value of water and to play up its cheapness, and that this has resulted in a far lower standard of service to customers in the water industry than in most other utility services. He called upon water works officials to initiate modernization programs to show the public that government can run a water utility as efficiently as a private company can operate some other type of utility. Harry Jordan, the popular Executive Secretary of the American Water Works Association, told his listeners that "The rapid increase in water needs in concentrated population areas, makes it impossible for any city of any importance not located on the Great Lakes or along the main stem of the Missouri, Mississippi or Ohio River, to omit from its plans for future water supply the construction of impounding reservoirs. Such reservoirs may well be off the main stream and in some cases be filled only at times of flood in the main stream. "These reservoirs," he said, "should be either directly connected by aqueduct to the city or industry for whose benefit the storage is developed or used to supplement the low water flow of the stream at the seasons of peak use in the urban and industrial centers."

One of the most controversial subjects on sewer design and construction is the determination of allowances for ground water infiltration and the methods for securing compliance with the established standards. Ellsworth L. Filby, of the

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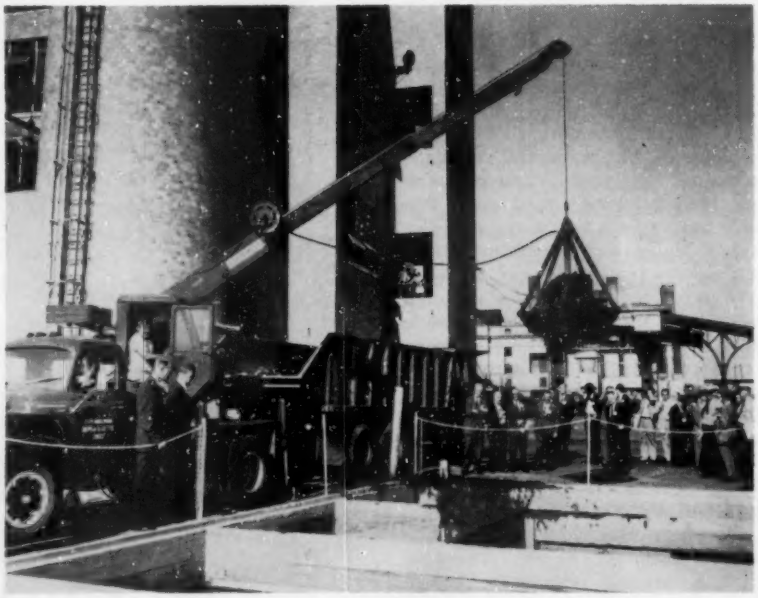

● **Visitors at the APWA Congress** in Philadelphia took time out from technical sessions to visit some of the city's public works facilities. Here a group is shown inspecting fly ash recovery at the Northeast Incinerator, where an Austin-Western hydraulic crane equipped with a clamshell bucket transfers silt from settling tanks to a waiting truck. The truck-mounted crane travels from plant to plant to service each of the city's four fly ash recovery systems. The silt is used for fill material.

consulting engineering firm of Black and Veach, Kansas City, Mo., said that "All engineers should strive to get as tight a pipe joint as possible, for the day is not far distant when all sanitary sewage will have to be treated before ultimate disposal and the volume to be handled should be kept as low as possible for elementary economic reasons." J. C. Brosseau, Director of Public Works of Verdun, Quebec, Canada, discussed the subject of "Cleaning and Maintenance of Sewers" and said that the amount of work to be done, unfortunately, is too often directly proportional to the errors in the assumptions made by the designing engineer, and/or the lack of good work by the contractor. Don Bloodgood, Professor of Sanitary Engineering at Purdue University, explained that it is extremely difficult to write regulations on the discharge of industrial wastes to a sewer system because the variations in the flow of sewage and many other factors have a bearing on the regulations that should be established. He also took issue with the practice of basing rates on the concentration of wastes. "In fact," he said, "it costs money to handle liquid so there should be some slight advantage to a discharger if he throws away a concentrated waste, if he is paying for treatment on the pounds of solids or BOD that are being discharged into the sewer system." Ralph E. Fuhrman, Executive Secretary of the FSIWA, discussed the various sewage treatment processes now in use and said that the practice of discharging treated sewage on land either by surface application or by subsurface irrigation is now followed by well over 100 communities in the southwestern part of the United States.

Operating and cost records, as they pertain to water and sewage works, was discussed by Joseph P. McBrien, Field Representative of the Public Administration Service, and Louis E. Ayres, Consulting Engineer of Ann Arbor, Michigan, told about recent developments in the financing of these facilities. He called specific attention to recent legislation in Maine, Vermont and Maryland, which authorizes the allocation of state funds to municipalities to supplement federal aid for the financing of sewage treatment plants.

Equipment Forum

W. C. Wichman, Director of Public Works of Cincinnati and Chairman of the Forum on Equipment, suggested that the APWA set up a Committee on Equipment to facili-

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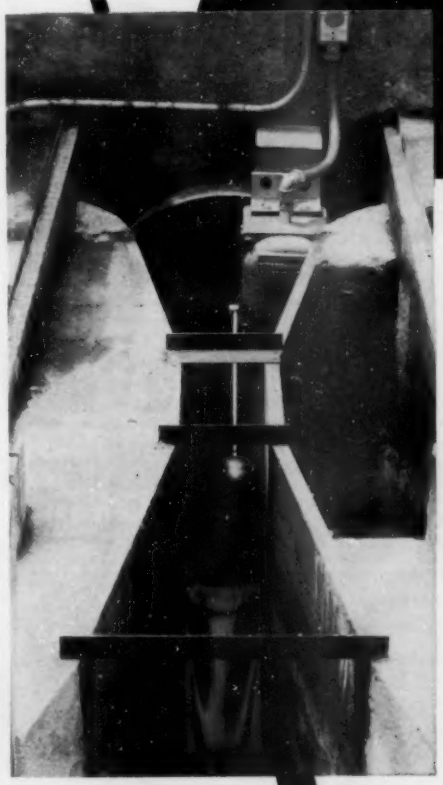

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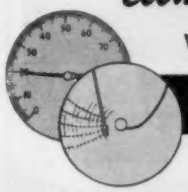

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tate the collection and dissemination of information on this important subject. William Foster, Editor of the *American City*, in addressing the forum said that "No municipal official dominates the purchasing habits of any municipal government to the exclusion of all others. The acquiring of equipment is a teamwork operation, and almost everyone has his voice in the selection.

The Dean of the City Purchasing Agents, Joseph W. Nicholson of Milwaukee, suggested that each city set up a Standards and Specifications Committee, which would consider tentative specifications, distribute them to all prospective bidders and invite their comments by letter or personal appearance at an open meeting before the specifications are finally approved. This procedure, he pointed out, has proved to be very effective in improving specifications, and eliminating the charge that the specifications are written around some particular manufacturer's product. W. Lowell Fisher, Superintendent of Automotive Equipment of Dallas, Texas, told delegates attending the Equipment Forum that an accident prevention plan must have some tangible incentive to employees in order to work. "This plan," he said, "ought to be spread as far down the line as is possible. . . . We feel that a plan which has recently been used by a number of private industries works very well. This plan gives so many points for each period without an accident. These points can be accumulated and used to purchase worth while merchandise. The merchandise offered includes, percolators, kitchenware of all types, etc. This not only spreads the base of the plan, but it also insures family interest."

George H. Elliott, Jr., Senior Mechanical Engineer of Baltimore's Department of Public Works, discussed the "Maintenance of Municipal Equipment," while Pershing J. Curran, Superintendent of Motor Equipment of Madison, Wisconsin, talked on the subject of "Central Garage and Shop Facilities." The Equipment Forum also included an interesting talk on Philadelphia's radio communication system by Edward P. Grim, Chief of Engineering & Communications for the Dept. of Public Property, and a discussion of the several methods of financing equipment by Ernest A. Fort, Director of Public Service of Miami, Florida, and J. J. Carrell, Director of Training of the International City Manager's Association.

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Removing WATER HYACINTHS from Settling Tank by Pumping

The work described in this article is part of a study program developed by the Florida State Board of Health. Data and pictures are from Ellis K. Phelps, Orlando.

IN CONNECTION with some experimental work on the recovery of plant food from sewage, water hyacinths had been planted in the secondary clarifiers at the Orlando, Florida, sewage treatment plant. After the hyacinths had multiplied and completely covered the tank surfaces, it was necessary to remove them to assure satisfactory performance of the basins. When manual methods failed because of the expense, Robert E. Simon, Plant Superintendent, suggested that their removal be attempted with a 4-in. Model "C" Wemco pump he had.

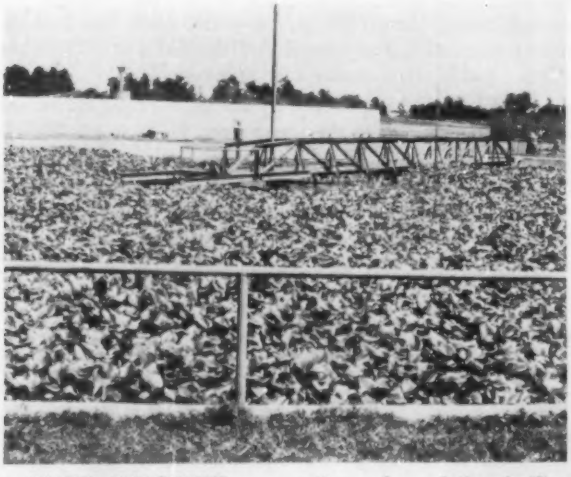
The Wemco pump and the motor were assembled and mounted in the bed of a small two-wheeled trailer drawn up alongside the secondary clarifier. A suction line of six-inch galvanized steel irrigation pipe was selected for convenience and lightness. No foot valve or check valve was used in this line. A one-inch pipe was set in the suction line just ahead of the pump and at an angle.

Several methods of leading the hyacinths into the suction line were tried before it was decided to make a funnel out of galvanized sheet iron to attach to the lower end of the suction line. This funnel had a throat diameter to fit the six-inch suction pipe, and the outer rim of the funnel was approximately 24-in. diameter. By experiment it was determined that the best arrangement of this funnel was to have it mounted with its axis in a horizontal position with the throat completely submerged, approximately six inches under the surface of the water. In this manner a man with a pole could drift the hyacinths into the throat where they would be caught in the current of water passing through the funnel and be picked up in the suction line. The hyacinths are about 98 percent water and break down into mushy, fibrous mass; all of the hyacinths from one of the tanks were discharged onto a sludge drying bed.

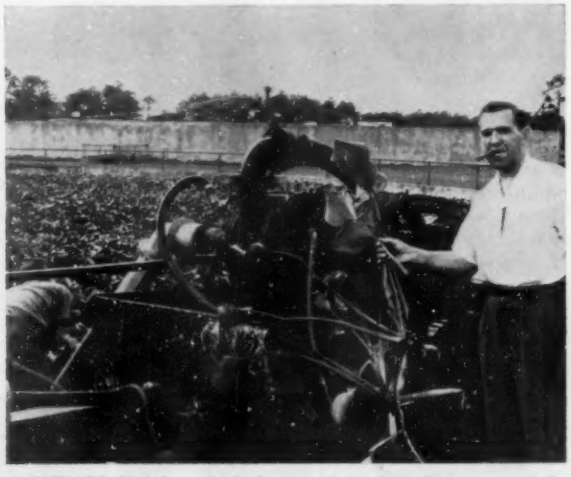
Operating difficulties were minor. One difficulty occurred when too many hyacinths tried to jam into the throat of the funnel at one time which resulted in stoppage at this point. It was found that the best way to remedy this was to stop the pump and allow the water in the pump to backflow into the tank, flushing out the jammed hyacinths. They were then loosened up by the man at the tank with his pole and fed in such a manner that they would not cause clogging. It was surprising to see how many would go in at one time, however. It was not necessary to feed the plants individually. Apparently almost anything that would pass the six-inch throat would go through the four-inch pump, which handled the difficult material surprisingly well.

There were a few exceptions, however, as choking in the pump discharge did occur at the discharge throat. When this happened it was necessary to disconnect the discharge pipe and remove the obstruction by hand. When the man in the tank gained experience, he was able to judge the speed with which he could feed the plants without trouble, and the latter part of the operation went much more rapidly.

Certain features are of more than ordinary interest. In the first place, the length of the hyacinths, up to 3 ft. counting roots and stems, is interesting as is the fact that they were not chewed up in the pump. They were mashed and squeezed with the cell structure broken down, but they were still whole fibrous strands. Material of this nature would pass through the pump with no difficulty whatsoever. The second point we appreciated was the ease with which this pump could be primed. No check valve or foot valve was used. The one-inch water line set into the suction line was all that was necessary in order that the eight-foot suction lift be accommodated; this line was used only to establish the prime, and the water was shut off as soon as the pump picked up its prime.



● **WATER HYACINTHS** cover entire surface of the clarifier. It was estimated that more than 100,000 plants were in tank.



● **WEMCO PUMP** sucked clumps of the big plants out of the clarifier and discharged them onto a nearby drying bed.

Texas Enacts Urban Renewal Legislation

In an act which became effective in August, the Texas State Legislature designated the State Department of Health as the planning agency to assist municipalities of 25,000 population or less with urban renewal programs. Texas cities in that population category may have a substantial portion of their planning expense defrayed through funds available under the Federal Housing Act of 1954, provided they can meet the other eligibility factors. These include evidence of need for planning and the correlated facilities and intent to carry out a progressive and continuing program. The need for financial assistance also must be shown. The Department of Health is empowered to contract with a consultant to provide designated planning services at a specified fee provided from funds of the Housing and Home Finance Agency and the city involved. Applications for assistance are received and evaluated by the State Department of Health, following which funds are released by the Housing and Home Finance Agency on the basis of approved applications. Detailed information on the functioning of this program may be obtained from the Division of Sanitary Engineering, State Department of Health, Austin, Texas.

• • •

Marquette Adds New Diesel Engine

A new diesel engine has been installed by the City of Marquette, Mich. This is a 7-cylinder, two-cycle diesel and the third Nordberg engine to be installed in this municipal plant during 1957. Earlier in the year, two 10-cylinder engines, each rated at 5140 hp, 3640 kw, were installed. The newest engine is rated 3830 hp at 257 rpm and will drive a 2700 net kw General Electric generator. Five Nordberg engines, totalling 19,910 hp, will have been installed since 1947.

• • •

North Carolina and Interstate Highway Contracts

North Carolina, during the period January 1, 1957 through May 31, 1957, put 109 miles of Interstate highway construction to contract. Texas followed North Carolina by putting 94 miles of Interstate highways to contract during the same period. North Carolina has 677 miles of highways on the Interstate System.

Municipal Water Filter Installation cost can be cut 1/2 to 1/3 with...

★ This Filter is also used extensively for swimming pool and industrial plant water filtration.

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1. The original cost of a diatomite plant for public supply is ½ to ⅓ the cost of a sand plant of equal capacity.
2. Diatomite filtration reduces the chlorine demand of the water by removing organic matter to an exceptionally high degree. The overall bacteria reduction in the effluent is from 80% to 90%. Sterilization of the finished water can be accomplished with much less chlorine. This results in reducing consumer complaint due to chlorinous tastes.
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4. Operating cost compares favorably with conventional sand.

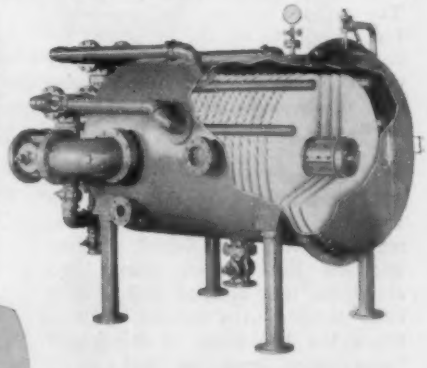
Less than 0.2% of water is required to sluice and clean the Model SCJ filter. The largest filter units can be cleaned and a new fresh diatomite pre-coat applied and the filter back in operation in 20 minutes or less.

Operators can be easily trained to handle this filter, no highly skilled specialized personnel is required to insure efficient performance.

Sparkler Model SCJ filters can supply practically any required volume of city water. Single units with a capacity of 5,000,000 gal. per day are available. Multiple units including a standby filter is usually employed to insure uninterrupted service for large volume requirements.

Modern electronic control instruments are readily adaptable to these filters, making uniform high quality water supply sure and automatic.

The startlingly low original cost, simple operation, and positive, consistent high quality filtration makes the Sparkler Municipal Water Works filtration system worthy of the most thorough consideration by water works engineers.



Interior construction of Model SCJ Water Filter. Sparkler filtration engineers have introduced, in the SCJ filter, new principles of diatomite filtering that are much superior to old methods and comprise the most advanced innovations in recent years.

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PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE WATER WORKS DIGEST

Maintaining Pipeline Flow Capacity

In Gorham, Maine, a study has recently been made on the maintenance of pipeline coefficients by chemical treatment with sodium hexametaphosphate after cleaning with a conventional pipe scraper. Gorham Village is one of the isolated areas supplied by the Portland Water District and has been ideally situated for a study of this type. A booster pump is located at Sebago Lake, the source of supply, to deliver the water through an 8-inch feed line to the system and the standpipe located about 11,000 ft. distant. Investigation had shown that the 8-inch line had a coefficient C varying between 50 and 56. For one month prior to cleaning, 4 ppm sodium hexametaphosphate was fed into the line in the hope that it might soften the tubercles and aid in the removal of the scale deposit. Then a 4,000-ft. section of the line was cleaned with a conventional pipe scraper. Immediately after cleaning a dosage of 7 ppm of metaphosphate and 6 ppm of zinc-bearing phosphate was fed into the line and continued for about 2 weeks after cleaning at which time the zinc-bearing phosphate was discontinued while the addition of hexametaphosphate has continued. The authors feel that the zinc-bearing phosphate should be added for this short period of time to lay down a coating on the interior surface of the pipe to hold the initial coefficient obtained from the cleaning operations. The coefficient C has remained at about a value of 121. Encouraged by this study of the first 4,000-ft. section, the remaining 7,000 ft. of 8-inch pipeline between the booster pump and standpipe was cleaned and chemically treated in a similar manner. Since the beginning of this study there have been no red-water complaints. The cost of chemical treatment as compared to the carrying charges on the cost of either water main replacement or reinforcement was small. While complete protection against corrosion was not obtained, carrying capacity was maintained.

"Maintaining Pipeline Flow Capacity after Cleaning." By William D. Monie and Harold B. Scales. *JAWWA.*, September, 1957.

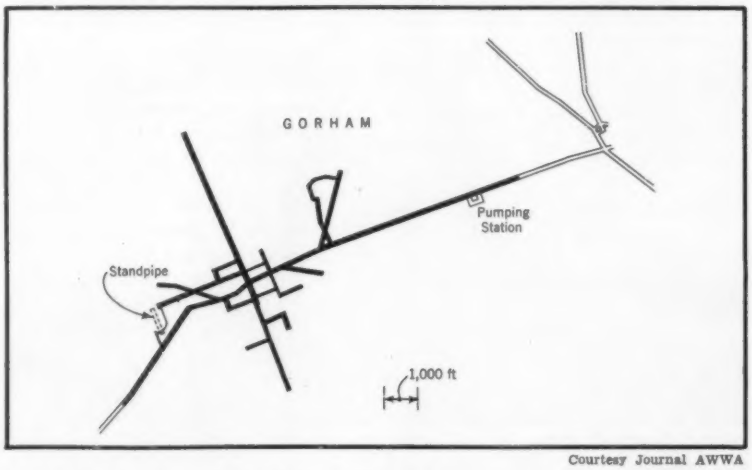
Waterborne Disease Outbreaks in 1956

In 1956 there were 9 waterborne disease outbreaks with 1,719 persons being affected as compared to 2 outbreaks with less than 50 persons ill in the previous year. The 1956 outbreaks represent 2 rather large and 2 small outbreaks among persons who drank water from contaminated public systems. The largest outbreak was classified as shigellosis involving 800 persons while another outbreak affected 700 persons. During 1956 there was also an increase in the number of cases of typhoid fever reported in the United States. Some of these outbreaks were definitely shown to be waterborne while others were suspected as being caused by contaminated water supplies. Eight outbreaks of infectious hepatitis were reported in 1956. One outbreak of 276 cases was considered to be waterborne and *Escherichia coli* was isolated from water samples although this evidence did not definitely incriminate the water supply. In 1956 there were 6 outbreaks of gastroenteritis, with 903 cases, which were shown to be waterborne. The article describes the method of contamination of the water supplies involved in several of these outbreaks.

"1956 Waterborne Disease Outbreaks." (From an article in Public Health Reports by C. C. Dauer, M. D. and Granville Sylvester.) *Public Works*, October, 1957.

Philadelphia's New Water Program

The City of Philadelphia is making tremendous strides in three big areas of municipal public works—sewage works, refuse disposal and water supply. Under a 10-year anti-pollution program costing $80 million, three treatment plants with a total capacity of 400 mgd and a number of interceptors have been completed. By 1960 all of Philadelphia's sewage will be treated before being discharged into the Schuylkill or Delaware Rivers. The City has also added 1350 tons per day of incinerator capacity by the construction of 4 new or expanded plants at a cost of $10 million. Another 2400 tons daily capacity of



Courtesy Journal AWWA

● **DIAGRAM of Gorham distribution system showing standpipe and pumping station.**

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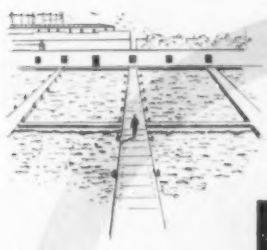
Rockwell Sealed Register Water Meter

With Powerful Magnetic Drive

incinerators is scheduled for completion before 1964 when all the refuse being collected will be incinerated. But the City's current ten year, $52 million reconstruction program in the water department is the municipal accomplishment in which they have the greatest pride. By 1960 when completed, 400 mgd of slow sand filter capacity will have been replaced by 487 mgd of modern rapid sand filtration plants capable of 730 mgd at continuous overload. At the heart of the new reconstruction program are three new filter plants located at the Torresdale, Queen Lane and Belmont sites (the Roxborough filters will be abandoned). The existing filter plants provide various combinations of facilities for pre-settling, coagulation, pre-filtering, slow sand filtration and storing of finished water. Essentially, the reconstruction of the plants involves constructing new chemical buildings, flocculation and sedimentation basins and rapid sand filters, with the existing pre-settling and finished water basins retained in the new schemes. Existing slow sand filters, occupying 30 times the space of similar capacity rapid sand filters, will be utilized as clearwells.



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"Golden Decade for Philadelphia Water." *Engineering News-Record*, September 19, 1957.

Rural Public Water Supplies

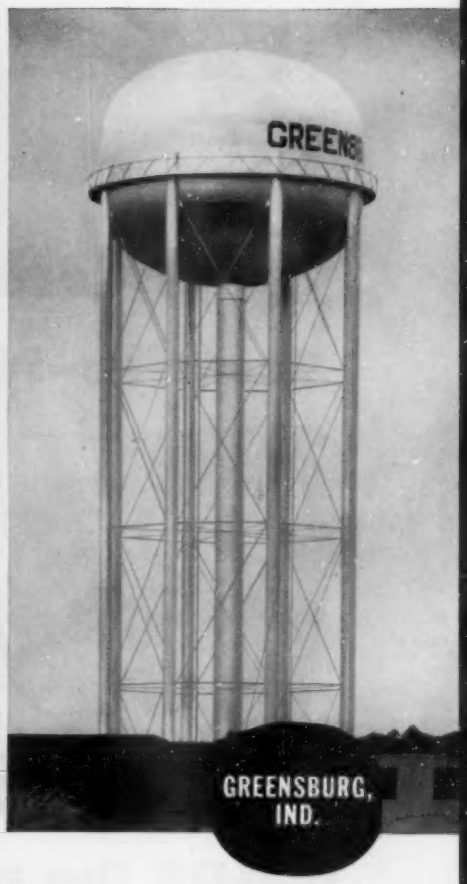
In developing public water supplies in county or rural areas near urban developments, it is necessary to consider many factors and some careful economic considerations must be made to determine the feasibility of providing even limited service in these partially developed areas. The author uses three examples or case histories to aid in the discussion of the many factors to be considered. The first example deals with the extension of an existing centrally located city system into a rural area. In the second example, a new system is owned and operated independently, having its supply imported from an adjacent system. The last example, which is concerned with the development of a new system and a new source of supply, is hypothetical. The value of these examples should be in their simplicity, clarity, and convincing evidence that every area should be analyzed and studied thoroughly before any construction is undertaken or certificate offered for sale. The costs involved in developing a water system in a sparsely inhabited area can differ radically according to the type installed as shown by the three examples.

"Development of a Rural Public Water Supply. Limited Service to Partially Developed Areas." By J. Moran Roberts, *JAWWA*, September, 1957.

Automatically Controlled Plant

MacAlester, Oklahoma, has recently completed a $250,000 modernization and expansion of its 32-year-old water treatment plant. This 10-million gallon plant can be controlled automatically from a centrally located graphic panel. The author states that it is the first of its type for municipal water treatment to be operated by a single operator for each shift. Indicating and recording instruments and valve position panel lights supply all the data needed for proper and efficient plant operation by providing a true picture of the entire treatment process at any given time. The instruments automatically control the levels of the clarifier, filters and clear well, operate chemical feeders and back-wash filters automatically, record and totalize flow rates, and balance treatment rate with demand.

50,000 Gallons **150,000 Gallons** **500,000 Gallons**



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"Central Graphic Instrument Panel Automates Filtration and Back-wash." By Rex Collins. *Water Works Engineering*, September, 1957.

Other Articles

"Notes on Water Works Law." By John H. Murdock, Jr. (This is the 12th and final installment in a series of articles discussing water works law.) Water and Sewage Works, September, 1957.

"Land Policy for Impounding Reservoirs." By Francis S. Friel. JAWWA., September, 1957.

"Public Access to Lands Surrounding Impounding Reservoirs." (A panel discussion presented at the AWWA conference, Atlantic City, N. J.). JAWWA., September, 1957.

"New Method for Fluoride Determination." By Floyd I. Brownley, Jr. and Edgar E. Sellers. JAWWA, September, 1957.

"Timber Reservoir Cover." By Homer Hathaway. Water and Sewage Works, September, 1957.

"Effective Corrosion Control." By J. M. Meeker. Water and Sewage Works, September, 1957.

"An Evaluation of Water Utility Earnings." (A panel discussion presented at the AWWA Conference, Atlantic City, N. J.) By Louis R. Howson et al. JAWWA, September, 1957.

"Oxidation-Reduction Potential Measurements Applied to Iron Removal." James G. Weart and Gerald E. Margrave. JAWWA., September, 1957.

"Experimental Evaluation of 'Water Conditioner' Performance." By Rolf Eliassen and Rolf T. Skrinde. JAWWA., September, 1957.

"Telemetering Coordinates Ten- City Water System." By Ormand A. Stone. Public Works, October, 1957.

"The Magnetic Flow Meter." By Russell H. Babcock. Water and Sewage Works, September, 1957.

"The Membrane Filter Procedure." By H. F. Clark, P. W. Kabler and E. E. Geldreich. Water and Sewage Works, September, 1957.

"Fluoridation: Facts—Not Myths!" By Louis I. Dublin. Water Works Engineering, September, 1957.

"One Operator, Seven Push Buttons Start-Stop Plant in One Minute." By Thomas A. Riddick. Water Works Engineering, September, 1957.

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Instrument Short Course on West Coast

The Seventh Annual Instrument Short Course will be held Thursday and Friday, January 30th and 31st, 1958, at the Los Angeles Harbor Junior College, Wilmington, California. This course is co-sponsored by the Southern California Meter Association and the Los Angeles Harbor Junior College.

This course covers all three phases of Instrumentation: Technical, which includes basic fundamentals, measurement, application problems and advance techniques of both pneumatic and electronic instruments as applied to flow, temperature and pressure regulation; practical methods for the training of engineers and technicians in the maintenance and calibration of instruments and control devices; and exhibits, which provide the opportunity of all to meet and discuss their problems with all the various leading manufacturers of these Instruments.

Thomas H. Ponton is Chairman; his address is 10219 Orange Avenue, South Gate, California.

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Underground Leakage Control Saves 14 MGD

A dye-test system has been developed by engineers of the Chicago Department of Water and Sewers which reduces leakage control cost greatly through exploratory searching for leaks. More than 14 mgd. of water were saved in 1956 by leak control measures. Chicago has more than 4,000 miles of water mains in use and leakage control presents a tremendous problem.

The **FORD**
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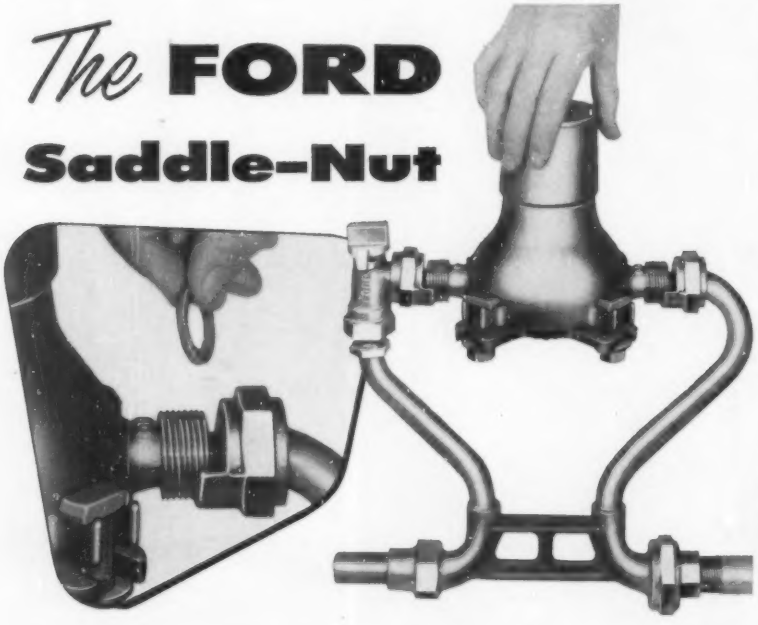

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The patented Ford Saddle Nut has a supporting lip extending about half way around the meter nut, so that it supports the weight of the meter, lines up the threads of the nut with the meter spud, and provides a place to hold the gasket before the nut is screwed onto the meter.

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Growing Population Demands Modern Water System

(*Continued from page* 119)

lifted to the feeding floor (plus 16) by a chain hoist.

Under the new arrangement, chlorine will be purchased one ton at a time, and ammonia will be bought 1,000 gals. at a time. Both chemicals will be piped directly from the delivery truck into plant storage tanks, and thence to the feeders. Alum will be purchased in solution, approximately 3,000 gals. at a time, and will be handled in similar fashion. Carbon will continue to come in in sacks. But the plant's new receiving dock is on approximately the same level as the feeding floor, rather than several feet below it. As a result, the time and effort involved in moving the carbon should be appreciably reduced.

Previously, seven men required about four hours to unload a truckload of alum, which was delivered as often as once a month. By piping liquid alum into storage, roughly the same quantity of material can be unloaded automatically in approximately an hour, estimates Supt. Lund. He expects similar savings with the other chemicals, and additional economies from purchase of larger quantities of chemical at a time. Labor costs won't be reduced, but personnel should have more time for other duties because of the new materials-handling system.

The chemical feeding room is being relocated so that the dispensing equipment will be closer to the mixing basins. Three new Wallace and Tiernan chlorinators are being installed, and the two ammoniators are being reconditioned. The dry alum feeder previously used has been replaced by a unit for handling alum in solution.

Pumping Changes

Extensive changes were also made in both low-lift and high-lift pumping equipment. The plant's original three low-lift and five high-lift pumps—all horizontal shaft units—were mounted approximately 12 ft. below grade (which is plus 7.5 Wilmette Datum). The pumphouse window sills are at plus 8.55. On several occasions, failure of the wash water sump pump has flooded the pumphouse floor nearly up to the top of the pump foundations. In winter, high winds have rolled lake water up against the windows to a depth of as much as a foot. Either situation could easily flood the pump motors, or a pipe might break and cause similar trouble. It would take weeks to recondition the motors, during which time the plant would have to shut down completely.

This danger has been minimized by installing the motors of the new vertical shaft pumps on a platform built at elevation plus 7.5, and the pump controls on the second floor of the pumphouse at elevation plus 16. The space used for these latter facilities had been occupied by a part of the chemical feed room.

One of the three original horizontal-shaft low-lift pumps, an Allis-Chalmers rated at 2780 gpm., has been taken out; in the same space, two vertical shaft units of the same make have been installed. Each of the latter is rated at 5560 gpm. (25-ft. head), and is driven by a 50-hp. motor. Two of the five high-lift pumps have been replaced also. The new units, both manufactured by Allis-Chalmers, are rated at 5560 gpm. and 3475 gpm. (both at 185-ft. head) respectively. The former pump will be powered by a 300-hp. motor, the latter by a 200-hp. motor. The units replaced were rated at 1040 and 1945 gpm. respectively.

The nominal total rated capacity of the old low-lift pumping installation was approximately 14 mgd However, the capacity in actual op-

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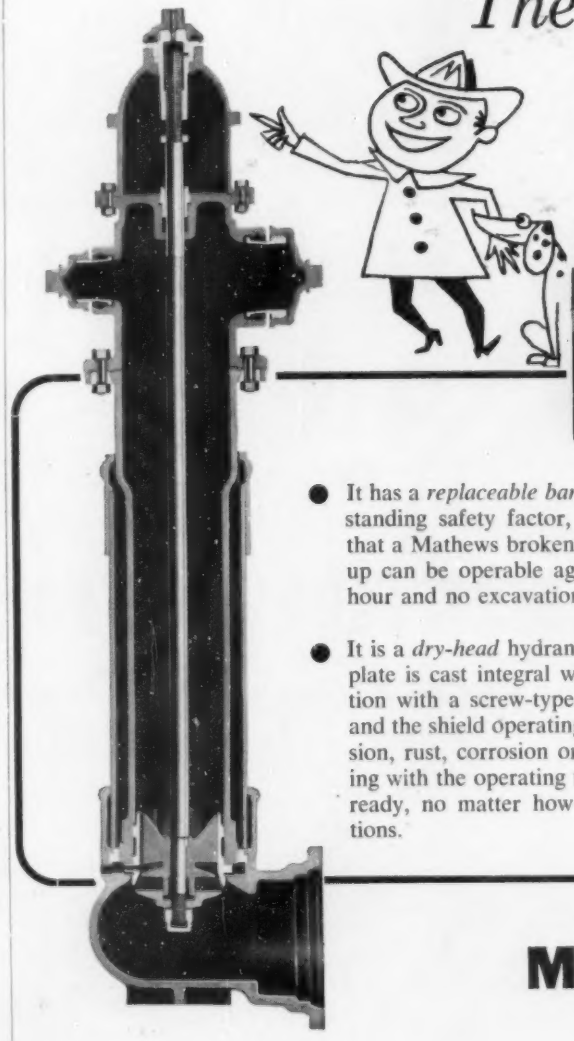

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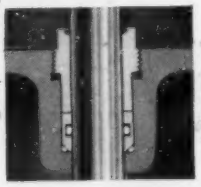


- It has a *replaceable barrel*. This is an outstanding safety factor, because it means that a Mathews broken in a traffic smash-up can be operable again within half an hour and no excavation is necessary.
- It is a *dry-head* hydrant. The stuffing box plate is cast integral with the nozzle section with a screw-type stuffing box. This and the shield operating nut prevent abrasion, rust, corrosion or ice from interfering with the operating thread. It is always ready, no matter how severe the conditions.

Made by

eration was only about 7 mgd. with the largest unit out of service, and only about 9.2 mgd. with all three pumps working. The new installation will have a nominal total rated capacity of about 26 mgd. with all four units operating, more than ample to meet anticipated 1980 demands. With one of the two 5560 gpm. units out of operation, the remaining three low-lift pumps have a rating of about 18 mgd. This capacity should be more than enough to meet water needs during the next 25 years at least.

The nominal total rated capacity of the five original high-lift pumps was 18.8 mgd. Actual capacity, with the largest unit out of service, was about 10 mgd. With the smallest high-lift pumps replaced by larger units, nominal high-lift capacity will be increased to approximately 27.5 mgd. When the largest unit is out of service, the high-lift pumps will have a nominal rating of approximately 19.5 mgd.

Wilmette's water distribution system, at the time the expansion project began, consisted of about 366,000 ft. of 4- to 24-in. mains, most of them 6-in. The Naval Air Station, Glenview, and the western part of Wilmette were supplied from a 12-in. and a 24-in. main. This supply was inadequate to meet the peak demand created by rapidly-increasing population in the latter two areas.

The situation has been remedied by laying a third main, this one of 24-in. diameter, from the pumping station to the western limits of Wilmette, which connects to existing lines that supply both Glenview and the Naval Air Station. A number of feeders tap this new main, increasing the supply of water going to Wilmette residents living in the western section of that village. Additional secondary mains have been laid in this area to improve flows and pressures.

A 4-million gal. capacity standpipe, 105 ft. high to the overflow mark, also has been erected at the western end of the new 24-in. main to help maintain normal pressures (38-46 psi.) during peak-demand periods. Although about 24 percent more expensive than an elevated tank of similar dimensions, the standpipe provides nearly 3 mg. more storage capacity. An Allis-Chalmers booster pump, rated at 3475 gpm. (50-ft. head), has been installed so that, if necessary, the entire contents of the standpipe can be sent into the distribution system at normal pressure. Utilizing gravity alone, about 1 mg. can be distributed at normal pressure.

The new standpipe, and an existing 400,000-gal. elevated tank, "float" on the system. They are filled during off-peak periods and are emptied, as needed, when increasing consumption reduces pressure below the desired minimum levels.

• • •

Driver Licenses Now Come in Metal

Metal driving licenses are being supplied by South Carolina. These are of light aluminum with the required information, including the applicant's signature, imprinted on the metal by a photographic process. The plate costs $1; or if the applicant already has a paper license a charge of 50 cents is made. In this case, he must give up his paper license when he gets the metal one. Two licenses for the same period are not permitted.

• • •

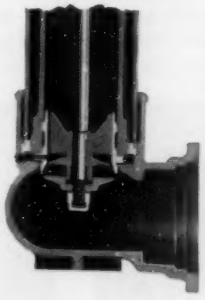
Evaluating Noise and Vibration Nuisances

A new activity of Milwaukee, Wisc., is the use of a sound frequency analyzer and a vibration pickup for evaluating noise and vibration nuisances.

HYDRANTS...

community protection by design

If you sat down and checked off the features that a well-designed hydrant ought to possess, you would find yourself describing a Mathews Modernized Hydrant



- The main compression-type valve opens *against* water pressure. The higher the pressure, the tighter the valve—a positively leakproof construction.

- **OTHER QUALITY FEATURES**

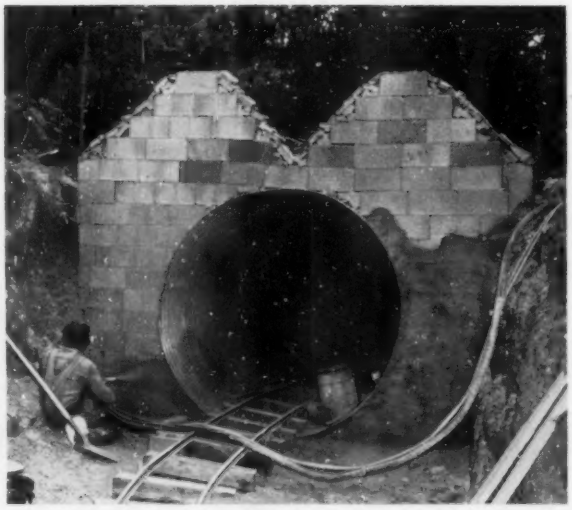
The operating thread cannot be bent. Head revolves 360°. Nozzle sections can easily be changed. Nozzle level can be raised or lowered without excavation. Bell, mechanical-joint or flange-type pipe connections.

R. D. WOOD COMPANY

Public Ledger Building, Independence Square • Philadelphia 5, Pa.

Manufacturers of Mathews Hydrants and "Sand-Spun" Pipe (centrifugally cast in sand molds)

● **CONCRETE** gunning required for the construction of a Lilliputian railroad tunnel led to the purchase of a Model 1250 Bondactor, made by the Air Placement Equipment Company.



● **TUNNEL** entrance was formed by placing dry blocks in position around steel pipes. A ¾-inch layer of concrete was then gunned on, to make a strong, fast, attractive job.

AIR-PLACED CONCRETE

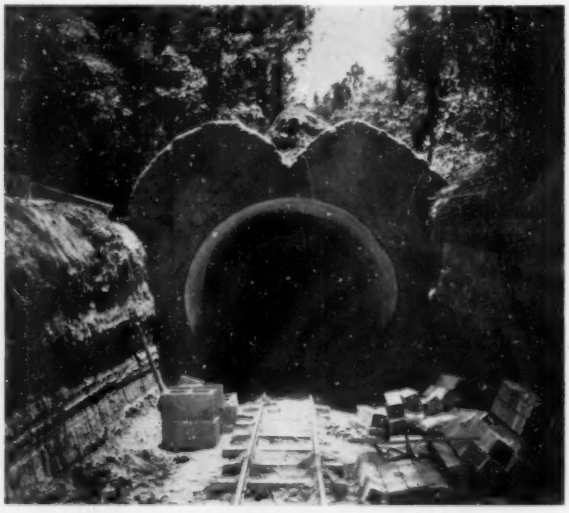
for Miniature Railroad Tunnel

CONSTRUCTION of a toy railroad at the City Zoo, Birmingham, Ala., involved some interesting minor problems in its building. To give the junior railroad enthusiasts a thrill, it was decided to construct a long curving tunnel. First a trench was dug about 7 feet deep; then Armco corrugated steel pipe was laid in the trench; the narrow gauge track was laid in the tunnel; and cement block headers were built at the ends of the tunnel, using joints without mortar.

An Air Placement Bondactor then was used to shoot ¾ inch of concrete onto both front and back surfaces of the headers before any backfill was placed. This method gives a much stronger wall than does the use of conventional mortar joints; and also permits rapid and economical construction.

The Park and Recreation Board of Birmingham, Lee M. House, Chairman, purchased this model 1250 Bondactor concrete gun from the Air Placement Equipment Co. in part to construct the railroad, but also for other construction work planned by the Board. Furthermore, it was desired to test the value of this equipment on road and street repair and for other work in the city. Many applications for air placing of concrete have been found, resulting in quick work and low costs.

● **AIR PLACEMENT** of concrete proved to be a simple and effective method for construction of the irregular parapet used on the retaining wall of the railroad tunnel entrance.

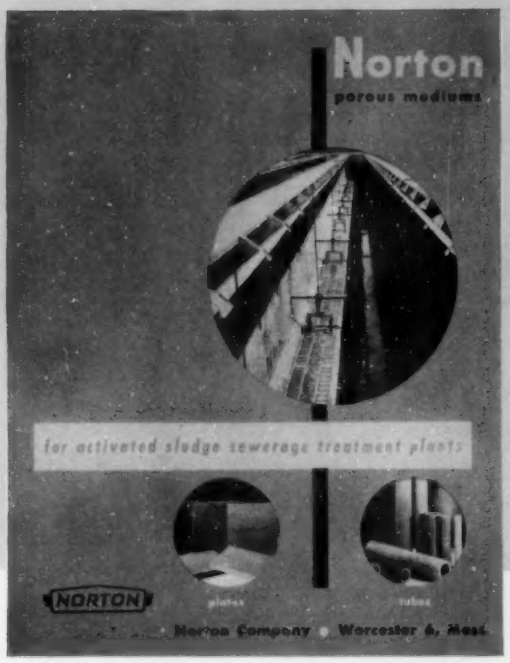


● **FINISHED** tunnel forms part of an exciting ride for youngsters visiting Birmingham's city zoo. The winding tunnel is made from sections of Armco corrugated steel pipe.

Send for these

VALUABLE GUIDES TO LOWER COSTS

Learn how Norton porous mediums save time and money in public works operations.



BOOKLET NO. 1246

For Activated Sludge Sewerage Treatment. Norton ALUNDUM* porous plates and seamless tubes have those qualities so necessary for lowest-cost operation — uniform permeability, heat resistance, chemical stability and strength. These and other advantages are described in booklet No. 1246 together with much needed information on proper choice, installation and cleaning of the mediums that will benefit you.

BOOKLET NO. 140

For Municipal Water Filtration. Public works engineers all over the country know that among the most important aids to efficient low-cost filtration are Norton ALUNDUM* porous plates and tubes. This applies equally to the filtering of drinking water as well as water for swimming pools. For more complete helpful information you should have booklet No. 140 offered here.

WE'RE READY TO SERVE YOU

by forwarding one or both of the two illustrated booklets described here. And you're cordially invited to take advantage of the Norton advisory and research departments — with assurance that thorough analysis will be given to your porous medium requirements. Remember: Norton refractory products are expertly *engineered and prescribed* to help you solve problems and cut costs. Address NORTON COMPANY, Refractories Division, 230 New Bond Street, Worcester 6, Mass.

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● **THE CONTRACTOR, Joseph David, Jr., points to Hamilton Kent "Tylox" Rubber Gaskets used on the cold, wet sewer construction job at Sharon, Pa.**

RUBBER JOINTS

Overcome Weather Conditions On Sewer Line Construction

FLEXIBLE rubber joints, used on 21-inch reinforced concrete pipe, overcame freezing weather, with snow and wet trench conditions, on a $100,000 sewer line contract along an approach to the Shenango Freeway near Sharon, Pa. The contractor was Joe David & Son of West Middlesex, Pa.; the rubber gaskets for the joints were "Tylox," made by Hamilton Kent Mfg. Co., Kent, O.; and the pipe was furnished by the Concrete Pipe Co. of Ohio, Inc.

The sewer line was a replacement for and followed the general course of an old inadequate line. Problems included working in near-zero January and February weather; the presence of rock and shale, necessitating blasting in some areas and sometimes to a depth of 20 ft.; heavy snow; and ground water from the old line which sometimes filled the new trench.

Pipe for the project was stacked in open ground near the trench, with the tongues easy to reach for "snapping on" the rubber gasket just before being moved to the trench for coupling into the line. This not only set up a fast-working operational flow, or production line arrangement, but provided the protection against prolonged exposure to sunlight which all rubber joints require. Once underground and under compression, however, the "Tylox" gaskets used on the line are expected to last as long as the pipe itself.

● **MID-WINTER construction progresses despite heavy snow and cold.**

● **PIPE SECTIONS were placed by the crane with only steering help from the men. Compression seals made by the flexible rubber gaskets formed water-tight joints.**

"The flexible rubber joints used for coupling the pipe turned an inhuman job into one that was put through on schedule, and with a minimum of misery," reported Joseph David, Jr. "We were sure of tight joints, in spite of doing most of the coupling in water, and the crane was able to lower each pipe into place with only steering help from the workmen who didn't even get their feet wet."

Chester Engineers, Consultants, of Pittsburgh, Pa., planned and supervised the project.

The Heenan Refuse Disposal Plant at Rochdale, England

The main disposal point for Rochdale (England) refuse has been the Cleansing Department's Depot at Entwisle Road since the latter part of the last century. During this period several disposal plants have been housed in the original buildings, and since 1937, when the previous plant was installed, the system of disposal has been by separation and incineration allied to steam raising. The latest reconstruction of the refuse handling and screening plant, still within the existing buildings, together with the re-conditioning of the furnaces and flues, places the plant once again among the most modern, for its size, in this country.

By a combination of mechanical screening, magnetic separation and manual sorting, all materials of marketable value are extracted from the refuse. The remaining refuse is burnt in furnaces coupled to boilers which, in conjunction with an independent boiler burning recovered cinders, provided the adjoining Central Baths with their steam requirements as well as heating the Cleansing Department's own workshops, stores and garage.

The new plant follows, broadly, the lines of its predecessor, but incorporates various improvements which have been evolved in the intervening years in refuse-disposal plant design. These include more intensive screening, improved cinders cleaning, more efficient recovery of ferrous metals and independent electric drives to all units. Apart from improving the efficiency, the aim has been to provide hygienic conditions for the employees operating the plant throughout the various stages of handling by the provision of equipment to collect floating dust.

An important factor in the scheme was the need to supply the adjoining Public Baths with the whole of its steam requirements varying from 3,000 to 8,000 lb. per hour over a 12-hour day. Stress was also placed on the maximum recovery of tins, the production of a good quality cinder and as complete a removal as possible of fine dust in order to assist incineration of the "tailings".

Six months' winter working has proved the efficiency of the plant in dealing with over 100 tons of crude refuse in 8 hours with an extraction rate of about 4 percent tins, 13 percent clean cinders and 50 percent fine dust. For a number of years this fine dust has been used for raising the level of a nearby 30-acre site subject to flooding and intended ultimately for use as playing fields.

THOROSEAL *Restored* this Filtration Plant

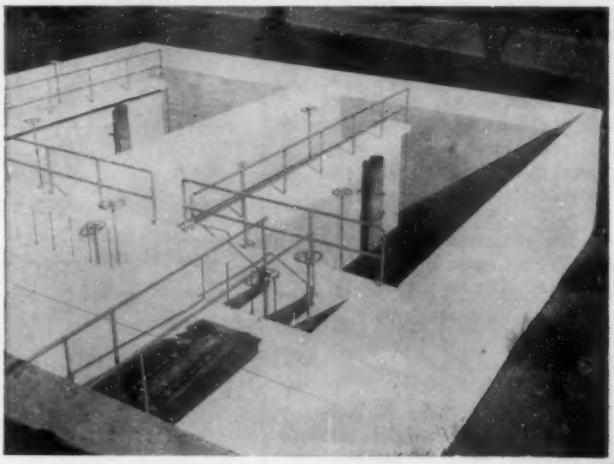
BEFORE

Example of complete break-down of masonry, due to penetration of water into body of concrete and action of frost in damp masonry.

It is amazing how THORO System products will correct a condition, such as shown in photograph. Concrete was sandblasted to remove all disintegrated material to sound concrete surface and reinforcing rods. Patching was done with THORITE Patching Mortar, bringing blistered areas to true and even lines, followed by two applications of WHITE THOROSEAL for protection.

AFTER

At minimum cost, almost ⅓ the cost of other methods, concrete restoration, patching and surface protection was completed with THORO System products on Filtration Plant in Keyser, West Virginia. Contractor: Standard Construction & Waterproofing Company, of Cumberland, Maryland.



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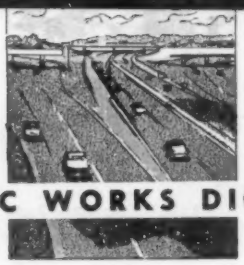


PUBLIC WORKS DIGESTS

Prepared by

FRANK FORCE

Associate Editor

THE HIGHWAY AND AIRPORT DIGEST

Dump-Body Concrete Delivery Helps Pave Third Lane

An inner third lane along each roadway of a 7.7 mile segment of the Industrial Expressway on the fringe of Detroit was built by dump-body concrete delivery. The inner lane of the existing inner shoulder was blocked off by cones, signs and flags to protect the job operators. In conformance with this scheme, the inner lane of the existing pavement was coned off to a point a few hundred feet ahead of concrete paving. The concrete was mixed at a nearby plant and hauled to the job by Maxon Dumpcrete bodies of 5.6 cu. yd. capacity. The Dumpcrete trucks entered the inner lane at the point of beginning of the day's pour, or not to exceed about 1500 feet back of the pour, unloaded and then proceeded to the nearest underpass for circling back to the plant via the opposite roadway. The excavation and grading of the lane was as follows: Three Tournapulls tore out and moved existing inner shoulder material with the initial cut being made immediately alongside the pavement slab; the spreading material was placed on the new outer position to build up the base for the relocated shoulder; graders were used to level and grade the subbase; and sand was placed as a base material.

"Dump-Body Concrete Delivery Helps Pave Third Lane Under Traffic." *Roads and Streets*, September, 1957.

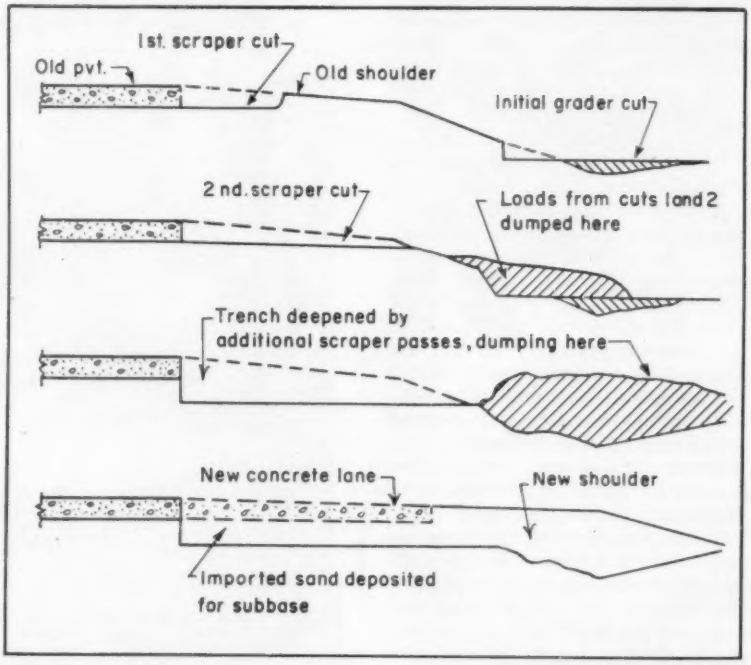
Airport Maintenance

Maintenance at the Tucson, Arizona, Municipal Airport falls into 4 classes, namely: regular, periodic, program and special. The first 3 classes are simple to forecast and incorporate in a budget. The fourth class becomes easier to contemplate with the passing of each year as experience records are developed. The type and make of equipment used varies appreciably, with some of it being purchased second hand and some of it bought under a planned purchasing program. The serious problem of tumbleweeds has been reduced through a two-pronged campaign of using weed killer in specific areas and forking weeds into a shop-built burner. This is a large hopper with a fuel line piped into the bottom with an old engine sleeve welded into the bottom of the fire box, through which a burner heats the pipe with waste oil, keeping a hot flame in the fire box. A maintenance superintendent and nine men are used to perform most of the maintenance in the periodic, program and special classes; and a terminal maintenance foreman and five janitors cover the regular maintenance. The maintenance budget for 1957-1958 is $271,000, broken down as follows: Field area $90,000; marking $7,000; hangars $55,000; lighting $5,000; utilities $10,000; public areas $18,000; terminal buildings $44,000; spur siding buildings $6,000; fire station and shops $10,000; and service equipment $26,000.

"Airport Maintenance." By R.W.F. "Bob" Schmidt, Manager, Tucson Airport Authority. PUBLIC WORKS, October, 1957.

The Road Surface and The Lighting Engineer

Since the aim of street lighting is to make the road surface as bright and uniform as possible, the light-reflecting characteristics of the surface as well as the lighting system must be considered. To improve the dry-weather light-reflection characteristics of the surface, the diffuse reflection should be measured by making surfaces light in color. To preserve good seeing conditions in wet weather, very fine surface textures, which flood easily, should be avoided. For this purpose medium or coarse surface textures are required. The increased use of coarser-textured surfaces and sandpaper finishes has reduced the preferential component of reflection from road surfaces. The indications are that the tendency will continue.



Courtesy Roads & Streets

● **NEW THIRD lane was added to highway by following the steps shown in diagram.**

HERE'S WHAT LEEDS, ALA., MEANS...

BY AN "ALL-AROUND MACHINE"

When the city of Leeds, Alabama, bought a motor grader recently, they picked a CAT* No. 112. The reason: "It's the best all-around machine."

In Leeds, the No. 112 ditches and shapes streets, grades roads, finishes blacktop surfaces and handles general street and sewer maintenance. And it does all sorts of special jobs, like smoothing out an athletic field, as pictured here.

Its versatility and dependability are no surprise to Street Supt. W. F. Layton. "We've used Cat products for years," he says.

The No. 112 is an ideal public servant. Operators like its convenient starting, its fast and reliable mechanical controls. They like its visibility—the fact that they can easily see the toe of the blade and front wheels while sitting down. They like the ease with which the No. 112's curved side shift rack lets them employ a full range of blade positions.

Owners like the No. 112's dependability and low-cost performance. They know, for example, that the Caterpillar frame is the strongest used in any motor grader on the market today. And they know the No. 112's tubeless tires not only greatly reduce down time, but are safer, cooler running and lighter to handle, too.

Let your Caterpillar Dealer give you complete details on a real all-around machine—the Cat No. 112 Motor Grader. Name the date—he'll demonstrate.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

99% OF ALL CAT MOTOR GRADERS EVER BUILT ARE STILL AT WORK

Therefore, high-angle light distributions, which were designed to take advantage of the high preferential reflection from the older types of surface, are now unsuitable with modern types of surface.

"The Road Surface and the Lighting Engineer." By A. W. Christie, M. A., B. Sc. *Contractors Record and Municipal Engineering.* August 21, 1957.

Reducing Bitumen Stripping From Aggregate

As a result of the laboratory and field tests it is concluded that tar provides a satisfactory and economical material for promoting adhesion under the conditions obtaining on main roads in New South Wales, provided the spraying viscosity is adjusted to suit road temperatures and conditions. Experiments and routine work elsewhere indicate that tar is ineffective if the viscosity of the sprayed binder is too high for satisfactory initial adhesion to the aggregate; further investigative work is needed to determine the most suitable way of adjusting the viscosity for low temperature conditions. In the meantime, the Dept. of Main Roads is not using the tar method when pavement temperatures are below 85°F. The Dept. has obtained superior results with (a) creosote precoating of aggregate, (b) a tar added to the bitumen to minimize stripping. Either process can be safely employed in the field under certain limitations. Aggregate must be free of dust before creosoting and normal care must be taken before successful bitumen surfacing work is done.

"Reducing Bitumen Stripping from Aggregate." *Highways and Bridges and Engineering Works,* August 21, 1957.

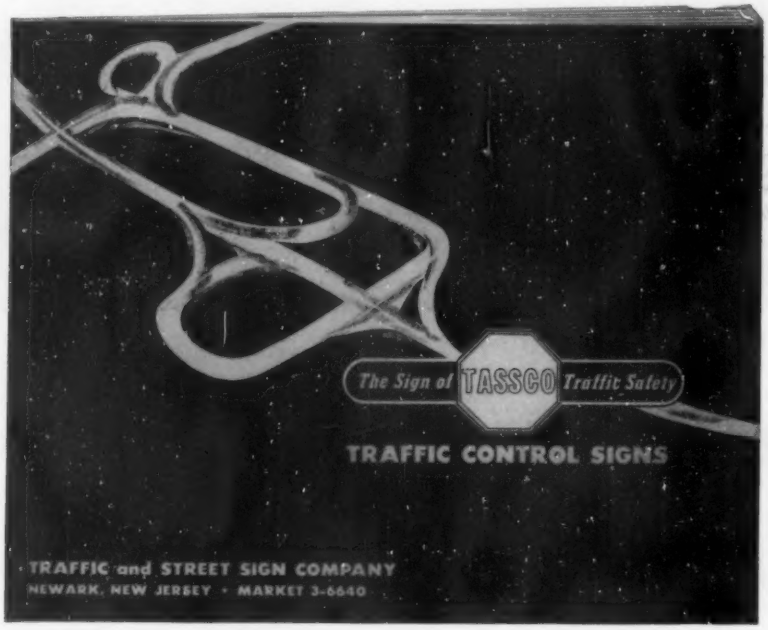
Depressed Medians on Alberta's Divided Highway

A 24-foot wide depressed median, which separates the four-lane divided highway between Calgary and Edmonton has helped to solve the surface water and underground springs encountered on the project. The entire roadway width is 100 feet. Bordering each side of the median is a 4-ft. gravel shoulder, followed by two 12-ft. traffic lanes and a 10-ft. shoulder for parking. Crossings between the two lanes are located every 1000 feet and are tunneled by small arch-culverts. Also at the crossings, drop inlets drain the median into the ditches by culverts under the road bed. The design calls for the crowns on each lane to be offset to the left or towards the median. The median will be loamed and seeded to grass and patrols will check the drop inlets for ice plugging during the spring runoff when completed.

"Alberta's Divided Highway." *Construction World,* August, 1957.

Programming Important For Effective Snow and Ice Control

Good equipment and a well-formulated plan can keep ahead of most snow falls in Appleton, Wisc. The county has employed consulting meteorologists and the city has worked out an arrangement with the county for the weather information. The weather bureau sends out the first indications of a storm and this alerts all employees. The second alarm is given by the police department when the pavements become icy and then the crews are called into action. For ice control, one truck-mounted spreader, tailgate spreader and a spreader using an auger are used to spread salt and sand. Two inches of snow usually requires the use of plows on hills. A 3 to 4-in. snowfall calls for the use of all plowing equipment to plow all streets. For plowing snow 4 graders, 16 trucks with snow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plows, one crawler mounted loader, one loader on rubber and two front end loaders are used. The city assesses the central business area 50¢ per front foot per season and the north side business area 40¢ per foot for snow removal services. A charge of 5¢ per foot of 5-foot walk is made each time snow is removed from the sidewalk.

"Programming Important For Effective Snow and Ice Control." By Edwin J. Duszynski, Director of Public Works, Appleton, Wisc. *The American City*, September, 1957.

State Operated Asphalt Plant

All maintenance operations on the Mississippi State Highway System are performed by employees of the highway department with state owned equipment. A state owned asphalt plant producing materials for resurfacing bituminous pavements and in surface treatments has been in operation for 10 years. The portable plant includes a drier, mixer, weighing scales, water tank, asphalt storage tanks, etc. The plant has a 60-ton per hour capacity, but the average output at a setup is usually 400 tons or less per 8-hour working day. Most setups of the plant have been adjacent to the road to be resurfaced, with others as far as two miles from the job. In most cases the sand-gravel deposits near the plant have been sufficient to provide suitable aggregate. The cost to produce one ton of hot-mix at one particular set-up was $4.48. This total cost includes aggregate production, asphalt, plant operation, hauling mix material, spreading and rolling and the move-in and set-up. The plant is rather crude in appearance, but it remains in a location for only 9 to 15 months, and has been dismantled, moved, and set up no less than twenty times.

"State Operated Asphalt Plant In Resurfacing By Force Account." By F. J. Russell, Engineer of Maintenance, Mississippi State Highway Department. PUBLIC WORKS, October, 1957.

A Well-Planned Snow and Ice Control Program

Peoria, Ill., has turned to greater use of salt for snow and ice control. Rock salt is used when temperatures are above 20°F and calcium chloride is used when temperatures are below 20°F. A 1000-pound 2 to 1 salt to chloride mixture is used per mile of two lane roadway for each 2 inches of snowfall. The mixture is placed on the centerline crown of the pavement so that the natural

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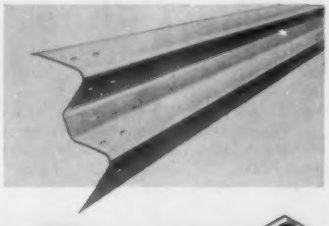

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Dodson's Digest

Preparedness is half the battle

We had our first snowfall of the season the other day. It was only a mild one, but enough to put a coating of ice on the roads.

It stopped snowing about noon, so I drove out to see Ed Miller. Ed is a county road commissioner, and I was surprised to find him sitting calmly at his desk, thumbing through a magazine.

"You don't seem very worried about icy roads," I remarked.

"I'm really prepared this year, Dod," Ed explained. "When the ice came today I was ready for it."

"There's nothing like being prepared," I agreed.

"I had all my stockpiles treated with Calcium Chloride last month," Ed went on. "So I had free-flowing abrasives today when I needed them."

"Come to think of it," I said, "I did notice on my way out here that your roads were pretty clear."

"We did the job in a hurry, too," Ed said. "We had all the main roads cleared early."

"You can give Calcium Chloride part of the credit for that," I pointed out. "*Nothing* melts ice faster than Calcium Chloride."

"I know," Ed agreed. "In fact, I've already ordered enough Calcium Chloride to last me all winter. It sure feels good to be prepared."

Just then the phone rang. It was Ed's wife calling. He didn't look too happy when he hung up.

"I guess I wasn't as prepared as I thought I was," Ed groaned. "I forgot to put Calcium Chloride on my driveway at home this morning. Do you know of a good auto bump shop?"

— L. D. Dodson

P.S.— Our leaflet, "How To Make Icy Surfaces Safe With Wyandotte Calcium Chloride," is full of helpful hints on ice control. To get your free copy, drop me a line today. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

Wyandotte CHEMICALS

WYANDOTTE CHEMICALS

MICHIGAN ALKALI DIVISION
HEADQUARTERS FOR CALCIUM CHLORIDE

drainage of the street will remove the snow and ice from the center to the gutter as melting action proceeds. Only 2 percent of winter storms produce snowfalls over 4 inches in depth and therefore only a minimum of equipment is available for use under heaviest snow conditions. Working arrangements are made with local industry, and contractors to provide snow removal and hauling equipment when deep snow conditions require emergency action. Forty-seven men are available for snow and ice control during the winter. The personnel available must be balanced against equipment to have efficient operation. Radio equipped Street Department vehicles help to coordinate the snow and ice removal plan. The city contracts for a commercial weather warning service and this service provides initial warning, amplifying reports when required, and an answering service. Alert to an impending storm, the Street Dept. notifies other agencies which include the Caterpillar Tractor Co., City of East Peoria, the bus company, police and fire departments and the city electricians. All these agencies play a major part in a snow and ice emergency.

"A Well-Planned Snow and Ice Control Program." By Leonard H. Caro, Director of Streets and Sewers, Peoria, Ill. PUBLIC WORKS, October, 1957.

Assembly-Line Fabrication Speeds Prestressing

Two trends in prestressed concrete are the extensions of the process to both foundations and superstructure and the placing of more emphasis on assembly line methods of mass production. Both these trends are readily apparent in the concrete spans of the approaches to the new high level cantilever bridge being built over the ship channel at Corpus Christi, Tex. All piles on the job are pretensioned, and a total of 370 girders in 37 spans are post-tensioned. When completed in the spring of 1959, the bridge will cost $9 million. Each pile was pretensioned with sixteen ⅜-in., 7-wire cables. Required to have a minimum ultimate strength of 20,000 lb., each cable was subjected to a 13,000 lb. pull or 167,000 psi. Flexible metal tubes to accommodate the 0.25-in. diameter high tensile stressing wires in post-tensioning girders were buried in the concrete as it was placed in the forms. The 40-ft. girders were stressed with four 12-wire units; the 60-ft. spans with four 12-wire and two 10-wire units; and the 70-ft. girders with seven 12-wire units.

"Prestressing on Corpus Christi's Bridge." *Engineering News-Record*, September 12, 1957.

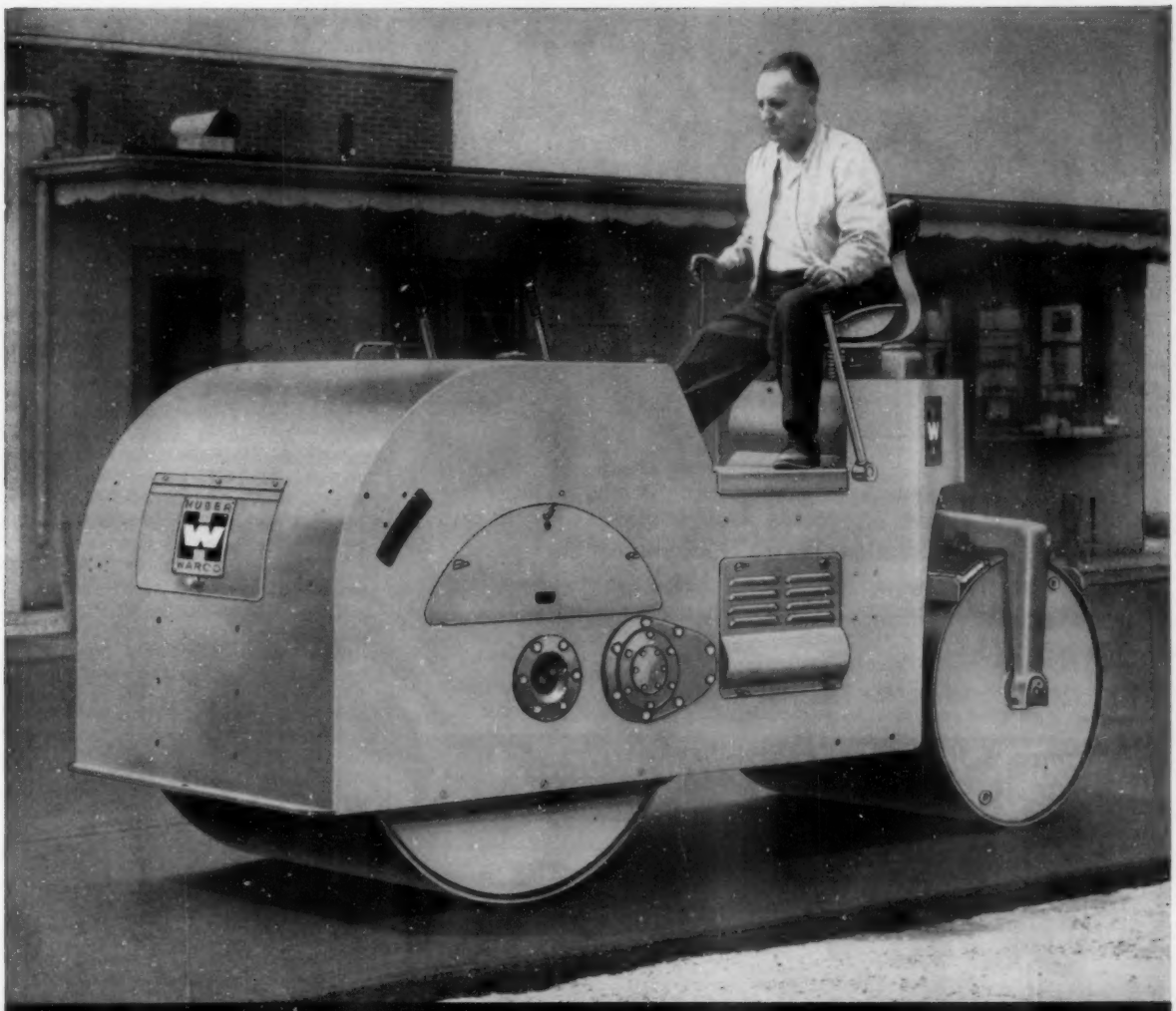
Tests of Blast-Furnace Slag Cement Concrete

Portland blast-furnace slag cement, a relatively new product in this country, is being used increasingly as an alternate for portland cement. Tests on this type of cement undertaken by the Bureau of Public Roads showed good results in strength and durability. Air-entrained concretes containing portland blast-furnace slag cements give lower compressive and flexural strengths at curing ages of 3 and 7 days, equal strengths at 28 days, and higher strengths at 90 days than comparable concretes containing portland cements. Varying the water-cement ratios of concretes containing portland blast-furnace slag or portland cement had only a limited effect on the relations of their compressive and flexural strengths. Tests to determine shrinkages due to loss of moisture indicated about the same results for the two types of cement.

"Tests of Concrete Containing Portland Blast-Furnace Slag Cement." By William E. Grieb and George Werner, Highway Physical Research Engineers, Bureau of Public Roads. *Public Roads*, October, 1957.

Flood Prevention and County Roads

In Mills County, Iowa, the county board of supervisors is sold on benefits accruing to county roads from a program designed to protect farm land in watersheds of small rivers and creeks. Twenty-four dual-purpose flood-retarding structures were planned by the County Engineer, State Highway Commission and the Soil Conservation Service. A procedure was set up whereby the soil-conservation service was to do all survey and design work and supervise the construction. All plans for the structures were approved by the Iowa State Highway Commission and the county board advertised the bids. The county board paid all the cost of the road structures and assumed the cost of all future necessary maintenance. Typical of the bridge projects was a structure with an annual maintenance cost of more than $1000. Soil-conservation service engineers designed a drop-inlet detention dam with a permanent pond of 4½ acres and temporary storage of 40 acre-ft. of water. The



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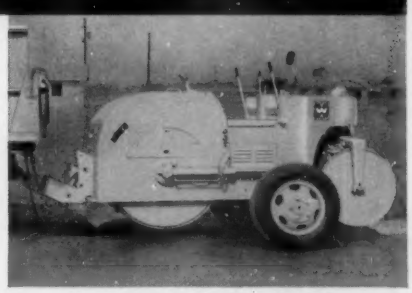

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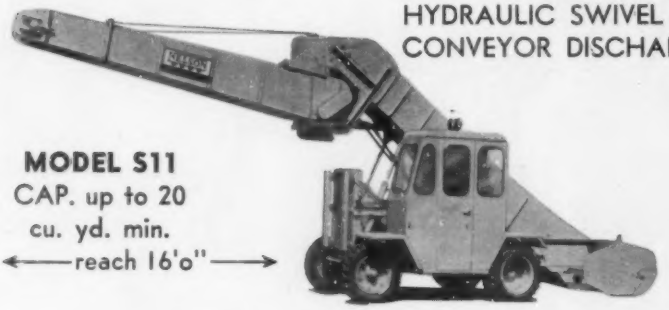

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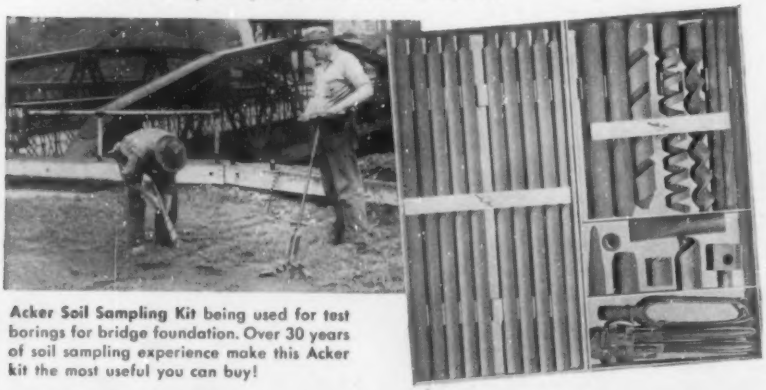

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drainage area above the dam is 600 acres, of which the run-off from 368 acres is controlled by two smaller dams in back of the main drop-inlet dam. The dam, which eliminates the need for a bridge is 33-ft. high, 1110-ft. long and has an earth fill of 25,580 cu. yd. The dam cost $13,-177 to build.

"Flood Prevention and County Roads." By Harold Severson. *Better Roads*, September, 1957.

Other Articles

"A Business-Minded City **Wanted Good Street Lights.**" By Guy Browning Arthur. Pubic Works, October, 1957.

"Electronic Traffic Control For Orlando." Downtown business area has an electronic traffic control system that includes 27 traffic lights. By C. E. Wright. Public Works, October, 1957.

"What Happens **When Hammer Hits Pile.**" It is possible with electronic digital computers to tell with accuracy that a certain type pile, driven with a particular hammer to a determined number of blows per inch, is being driven against a definite number of tons ultimate driving resistance. By Edward A. Smith, Chief Mechanical Engineer, Raymond Concrete Pile Co. Engineering News-Record, September 5, 1957.

"Utility Changes Needed For Chicago Skyway Toll Bridge." By Dewey Johnson, Research Engineer, Cast Iron Pipe Research Assoc. Public Works, October, 1957.

"How to Step Up Your **Design and Drafting Efficiency.**" A three-year study carried out by a committee of designers of E. I. du Pont de Nemours & Co. culminated in a multitude of recommendations for updating design practices for tomorrow's engineering. Engineering News-Record, September 12, 1957.

"Operations and Activities of **Materials and Research Department.**" Part II, Pavement section. By Ernest Zube, Supervising Materials and Research Engineer, California Dept. of Highways. California Highways and Public Works, July-August, 1957.

"Arizona Department Introduces Secret Weapon." **A plastic and metal production control board,** four feet high and seven feet wide, shows the exact status of every major job under consideration by the highway department. American Road Builder, September, 1957.

• • •

Milwaukee Revises its Building Code

A building code supplement issued by Milwaukee, Wisc., brought into print a number of chapters which had been under revision by the building code committee for some time. This resulted, in 1957, in the publication of the first com-

plete building code for the city in nearly forty years. Some chapters of this code have been published as separate pamphlets for the convenience of specialists in those fields.

• • •

Liability for Damages Caused by Construction of Dividing Strip

Courts have rather consistently held that the inconvenience caused by construction of a dividing strip in a street or highway does not entitle an abutting landowner to damages. A recent Maryland case reinforces this holding. The case arose as a result of the State Roads Commission's action in reconstructing a highway into a divided, four-lane dual facility with a center median strip dividing northbound and southbound lanes of traffic so that left turns could not be made directly into a shopping center without taking a more circuitous route. The owners of the shopping center sought an injunction to halt construction, which was denied by the Circuit Court.

On appeal the State Supreme Court held that construction of the median did not constitute a taking of the abutting properties and the State Roads Commission was not liable for damages. (Langley Shopping Center v. State Roads Commission, 131 A. (2d) 690, May 7, 1957.)

The owners of the shopping center did not deny the State Roads Commission's authority to construct median strips. They did complain, however, that the strip would prevent direct access to the far sides of the roads bordering on their properties, and this would amount to substantial denial of their rights to ingress and egress, and to a taking of their property without compensation.

The court was of the opinion that the State's action was more nearly akin to a diversion of traffic than to a blocking of the owner's means of access to the highway. It appeared entirely reasonable, continued the court, that if the State could divert traffic entirely away from the owners' corners without being liable for damages for so doing, it might, in the interest of safety, and without incurring liability for damages, interpose an obstacle which might render access to the property more difficult, while not actually destroying access to the highway. Any other view, the court concluded, would require the State to pay highly for the privilege of further improving and adding to the safety of highways which it had built and which had evidently brought customers to the doors of owners of land abutting such highways.

This Jaeger 2PN pumps 10,200 gph through a 2" suction line — all the water a 2" hose can handle. **With 2½" hose, it pumps 14,400 gph.**

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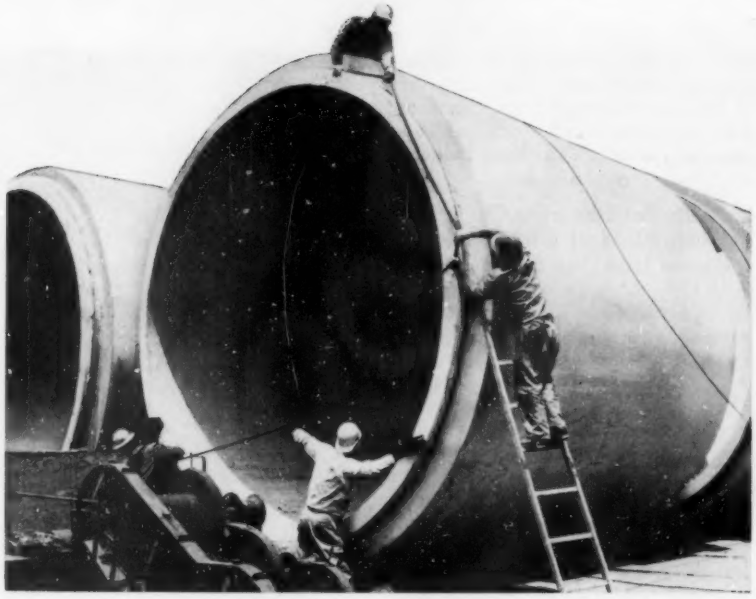


● FOUR-MAN crew puts rubber gasket around end of 168-inch pipe. Two lines will handle 352,000 gallons per minute.

14-FT. DIA. PIPES CARRY SEA WATER TO STEAM STATION

UNIQUE in concrete pipe making is the 14-ft. diameter pipe which American Pipe and Construction Co. is producing for the Southern California Edison Company's new steam station at Huntington Beach, California. These 16-ft. long sections are presently being installed in twin pipe lines which will circulate 352,000 gallons of sea water per minute from 2500 ft. out in the ocean to the station's condensers, and back again.

In order to economize, the Edison Company sought a new pipe design —one which, by its large diameter, would eliminate the need for additional smaller pipe lines otherwise required to do the job. It would take four pipe lines of 108-in. inside diameter pipe to circulate the same volume of water that these two 168-in. inside diameter pipe lines can handle.

New Design Problems

In the early planning stages, Edison Co. and American Pipe engineers realized that many new problems would be encountered in the manufacture, handling and installation of subaqueous pipe of this large diameter. An important requirement was the weight limit of the pipe. The limitations of available laying equipment required that all pipe for underwater offshore installation should not exceed 50 tons weight per section. Therefore, in calculating wall thickness and design strengths for pipe, the engineers had to use weight limitation as a base factor. Estimates indicated that such a 14-ft. inside diameter 16-ft. pipe section, composed of standard concrete aggregates, would weigh at least 75 tons. Through research and testing, engineers evolved a pipe design using a mixture of lightweight concrete aggregates which reduced the weight per section to 50 tons, but which retained the strength and durability of pipe composed of standard aggregates.

Specifically, the pipe produced is the non-cylinder reinforced concrete bell and spigot type. A rubber gasket joint is used for closure. Two concentric steel reinforcement cages are cast into each pipe section. The structural design of the pipe provides that stress in the reinforcing steel will not exceed 12,500 psi when the pipe is subjected to its maximum internal design pressure, nor will it exceed 18,000 psi when subjected to maximum possible stresses of the combined internal pressure and external loadings.

The size and weight of these pipe sections required the solution of additional problems involving estimating, new form design, modification of cage and handling equipment, and many related production problems. By March, 1957, delivery was in progress, at the rate of four pipe sections per day. Installation of the pipe, which is being handled by the Macco Corporation, was to be completed by August 1.

To transport the pipe from the manufacturing plant in South Gate to Huntington Beach, 32 miles away, it was necessary to design a trailer which would conform to the specifications of the California State Highway Bridge Department. Specially-built for American by Utility Trailer Corporation, the rig has two trailer extensions which spread the weight of the pipe section along 99 ft. of road, and 42 tires to cushion the load and prevent damage to the highway.

American Pipe & Construction is currently undertaking another engineering project which utilizes five of these giant truck and trailer rigs. This project, for the Metropolitan Water District of Southern California, involves the manufacture and installation of 47 separate siphons, comprising a total of approximately 63,000 feet of 13-ft. and 13½-ft. diameter pipe, spaced along a 183-mile aqueduct from the Colorado River to Whitewater, California. These siphons, which are calculated to bring the original Colorado Aqueduct up to its full design capacity, are slated for completion by December, 1958. This will bring an additional 645,000,000 gallons of water per day to Southern California, more than doubling the present carrying capacity of the Colorado River Aqueduct.

RECOMMENDED PRACTICE FOR WINTER CONCRETING

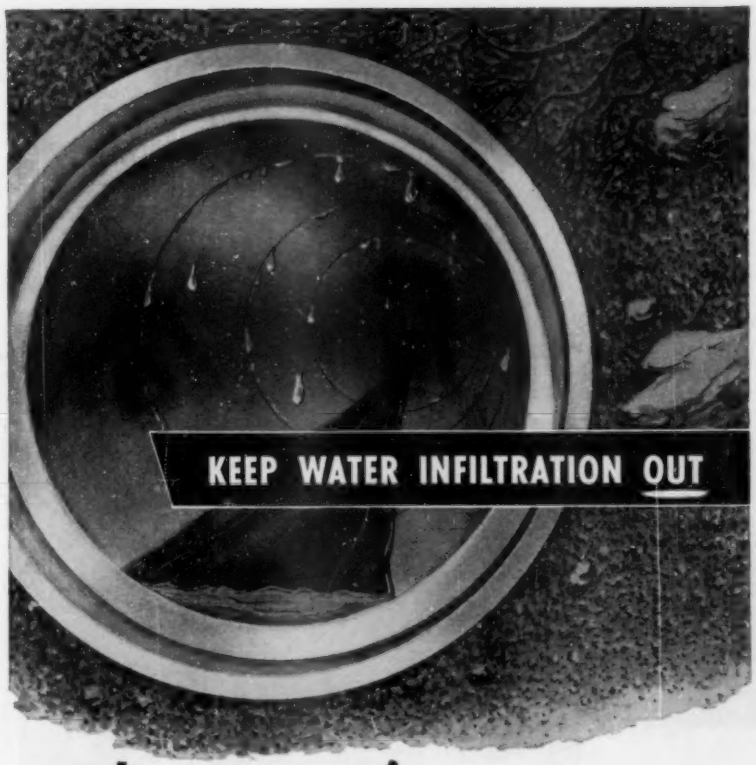
Air-entrained concrete and addition of one percent of calcium chloride by weight of cement are recommended for cold weather concreting. They permit a reduction in the time newly placed concrete should be protected. The use of accelerators and antifreezes, keeping of temperature records, heating of materials, subgrade preparation, protective coverings, heated enclosures, curing and form removal are discussed for several types of concrete structures and preferred methods are indicated in this bulletin. Copies are available from American Concrete Institute, 18263 W. McNichols Rd., Detroit 19, Mich. at 75¢ per copy.

SERVICE MANUAL ON SPRAY EQUIPMENT

A complete DeVilbiss Service manual totalling 405 pages and containing a full parts list as well as general information on installation, operation, and maintenance is available from The DeVilbiss Co., Toledo 1, O., and is $2.50, net. FOB. The manual provides up-to-date literature and reduces errors in ordering material and service parts.

BITUMINOUS MATERIALS FOR HIGHWAY CONSTRUCTION

This 460-page compilation includes specifications, test methods, recommended practices, and definitions of terms pertaining to bituminous materials used in highway construction and in waterproofing and roofing. This is the 6th edition of the compilation which is sponsored jointly by ASTM Committee D-4 on Road and Paving Materials and Committee D-8 on bituminous waterproofing and roofing materials. A few standards covering creosote materials which are under the jurisdiction of Committee D-7 on wood are included. There are 112 standards covered in this book. Copies are available from ASTM Headquarters, 1916 Race Street, Philadelphia 3, Pa., at $4.75 per copy.



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DESIGN OF HIGHWAY FENCES

GOOD FENCING requires careful design and construction to insure long life with minimum maintenance. Here are points to consider:

Line-posts—It is good practice to use a line post of 3-in. minimum top diameter. Larger diameter posts are not needed for strength, and their use will increase costs needlessly. A fence height above ground of 4½ ft. is considered sufficient to hold livestock. In areas where rainfall is light and soils are heavy, a post 6½ ft. long with 2-ft. embedment is commonly used. In other regions, the 7-ft. length with 2½ ft. set in the ground is preferable. A spacing of 14 ft. between line posts should be the maximum span for fence strength and good appearance.

Pull post assembly—Such an assembly may be placed at intervals of 20 rods in straight fence on level ground or at any sharp vertical angle point in the line. A typical structure of this type consists of a two-post anchorage, based on posts of 4 or 5-in. diameter which are set in line 8 ft. apart and embedded 3 ft. in the ground. A 4-in. by 8-ft. horizontal brace post is placed 6 in. below the tops of these two vertical pull posts and connected to them by two ⅜ x 4-in. steel dowels. The dowel pins should extend 2 in. into each end of the horizontal brace posts and to the same depth into each pull post.

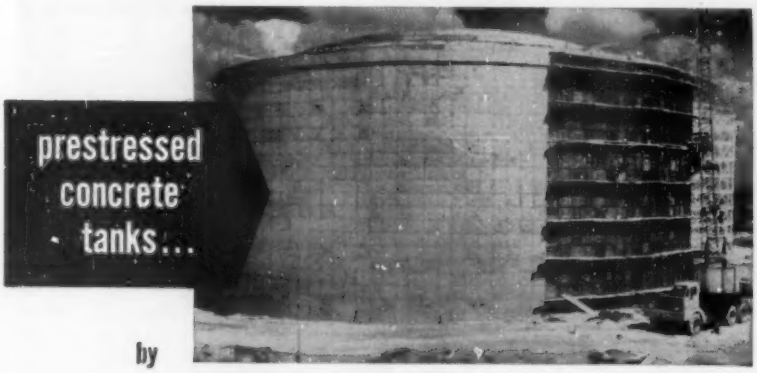
Two strands of No. 9 galvanized wire are run as a brace diagonally from 4 in. above the groundline on each pull post to just below the brace post at top of the other pull post. An extra loop is made around the post at each point of attachment, and the wire is firmly stapled to the post. These brace wires are then twisted until the assembly is rigid.

Corner construction—A corner assembly is installed at all horizontal angle points in the fence. The corner post itself should have a minimum top diameter of 5 or 6 ins., a length of 8 ft., and should be set 3½ ft. deep in the ground. In case the distance to the next corner or pull post is less than 10 rods, one approach span on that side is deemed sufficient. Otherwise, two approach spans to the corner post are needed. These are built by setting 4 or 5-in. diameter posts 3½ ft. in the ground and adding 4-in. x 8-ft. brace posts as in the pull post assembly. Four strands of No. 9 brace wires are then run diagonally from the tops of the vertical approach posts to the groundline of the corner post and twisted tight. In another pattern of bracing, the diagonal tie wires are run from the top of the outer approach post to the base of the inner approach post instead of to the base of the corner post.

Wire Fencing—Suitable woven wire for highway right-of-way fencing may vary in weight with the need and the severity of exposure. The usual requirements for this purpose are between 9 and 12½-gage for woven wire. All fence wire and tie bracing should be properly galvanized in accordance with recognized standards for durability.

Load test—The corner, end and pull structure constitute the framework within which the fence is built and its performance depends upon their stability. Research has been carried on at Iowa State College on fence ends and corners. These tests showed, among other things, that the holding power of corner and end posts may be doubled by increasing their depth of set from the usual 2.5 ft. to 3.5 ft.

Short brace spans induce uplift in corner posts. Single span structures



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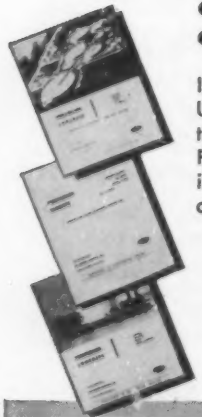

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developed holding power ranging from 3,300 lb. to 6,500 lb. Inasmuch as 3,000 lb. has been estimated to approximate the pull on a fence end which may be reached under favorable circumstances of wire stretch and low temperature, it is obvious that the use of single spans are adequate in most instances. A good double span corner, however, easily resisted 230 percent of the pull which ruptured a single span corner.

Construction Practice

Post Placement—Wood posts may be set in drilled holes and tamped into position with soil. If the posts are to be driven with power equipment, the small end is pointed for this purpose. The driving of posts is usually preferable to setting in drilled holes, because it is cheaper and faster. On the Kansas Turnpike, some 175,000 wood posts were driven in all types of soil at rates up to 30 per hour per driver. The Danuser driver was employed throughout the project.

Where rock in encountered, a 3-in. diameter hole may be drilled for the 3-in. line post and the post driven into it. Larger holes may be dug or drilled and the posts backfilled with tamped earth or grout.

The alinement of posts can best be achieved by stretching a strand of wire on the ground between pull posts or corners. If barbed wire is included in the fence, a strand of this can be used for that purpose and later lifted and stapled in place.

Ravine Crossings—The fence can be carried across small depressions or water courses on posts of extra length. The space below the fence fabric may be closed with extra strands of barbed wire or with flood gates of pressure treated wood.

Attachment of Fencing—The wire should be placed on the side of the posts facing the farmer's field or livestock, except that on curves the fencing must be attached on the outside of the curve in order that the wire can be pulled tight against the posts.

The staples ordinarily used to fasten wire to posts are of 9-gage stock, galvanized, with a length of 1½ in. These should be driven crosswise with the grain of the wood and at a slight downward angle to obtain the best anchorage. The staples should not be driven tightly against the wood but should leave just enough free space for the wire to move a little for automatic adjustment in tension with changes of temperature.

This material was condensed from an article in *Wood Preserving News*.

On-the-Job Filter Research Tour

Complete test facilities for problems involving solids-liquid separation through filtration, have been brought to processing plants along thousands of miles of American highway during the past six months. Filter technologists have brought the Eimco portable research laboratory into 31 states to conduct on-the-job sample testing, concentrating on plants where production level makes small-scale sampling insufficient and where physical characteristics in the feed cause sample distortion during shipment.

Operation of the Milwaukee Activated Sludge Plant

The sewage disposal plant at Milwaukee is an activated sludge plant with a capacity of 200 million gallons of sewage daily. During 1956 the plant treated an average of 155.8 million gallons daily, with an average reduction of 92.4 percent in bacteria, 95.8 percent in biochemical oxygen demand, and 94.1 percent suspended solids. During the year, 77,400 tons of Milorganite were produced and all was sold as this high nitrogen content fertilizer has a ready market.

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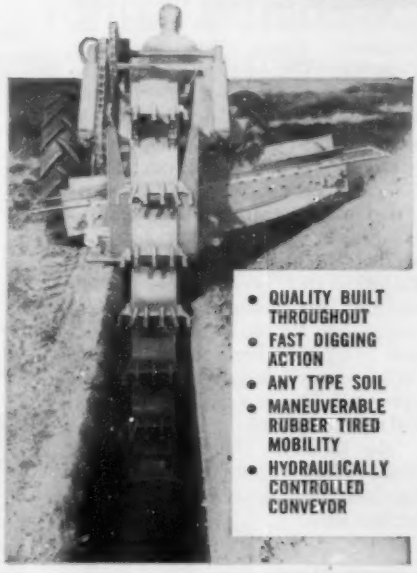
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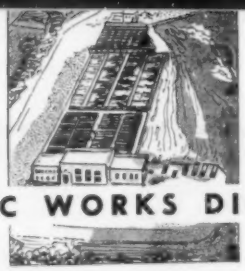


PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D.
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE SEWERAGE AND REFUSE DIGEST

Teutopolis Finances Own Supply

Teutopolis, Illinois, a village of less than 1,000 persons, has constructed a water system, a sewer system, and a sewage treatment plant and financed most of the work through bonds sold within the community. The village installed its first public water supply in 1941 and 1942. This consisted of a 74-foot deep gravel-walled well with a safe yield of about 70 gpm. This well served as the sole supply for the community from 1942 to 1956. Lack of rainfall in 1952 caused the water level to drop to a critical point. In 1954 a 31-foot well was drilled and 48-hour pumping tests indicated that it would produce a safe yield of about 80 gpm. This well was located about 3 miles east of the village making it necessary to lay 13,800 ft. of 6-inch line to connect the new well to the treatment plant. This treatment plant has been in service since the installation of the first well, to condition the water which had a hardness of 327 ppm as $CaCO_3$ and a relatively high mineral content of 473 ppm. The village has not borrowed money through bond houses or outside organizations but has peddled the bonds on the street. The $70,000 water revenue bond issue sold in 1941 financed the original plant while $50,000 of a $70,000 general obligation bond issue sold in 1956 was used to cover costs of the new well, pipeline, and distribution system extensions.

"No Outside Help Needed for Water Works Financing." By J. R. Gardner. *The American City*, September 1957.

Sewage Plant Operation

Professor Kenneth W. Cosens has written this article to provide the sewage treatment plant operator with some basic information and reference data that will give him a better understanding of those factors that enter into treatment plant operation. The article includes a discussion of each of the following items: 1) Flow, concentration and temperature measurements; 2) proper sampling; 3) laboratory determinations; 4) purposes of treatment; 5) operation of grit chambers, screens, and some comminutors; 6) purpose of sedimentation and design and operation of settling tanks; 7) operation of Imhoff tanks, including both the sedimentation and sludge compartments, drawing off sludge, foaming, etc.; 8) operation of activated sludge plants, including the problem of bulking; 9) trickling filter operation, including care of nozzles and orifices, dosing tank, problems of pooling or ponding, filter flies, odors, etc.; 10) disinfection of sewage for bacterial reduction or odor control, the forms of chlorine, operation of a chlorinator, computing dosages, etc.; 11) sludge digestion tank operation, including a discussion of moisture content, amount of sludge, and operating difficulties; 12) sludge disposal, including a discussion of sludge beds, depth of sludge on beds, care of beds, disposal of the sludge, using chemicals as drying agents, as well as difficulties in winter operation, vacuum filters, metering devices, sludge pumps, sewage pumping stations, etc.; 13) other factors, such as safety in the sewage plant, maintenance of adequate operating records, and plant blueprints, together with an adequate library. The author also states that the operator should be skilled in his work and he should be paid in accordance with his skill.

"Operation of Sewage Treatment Plants." By Kenneth W. Cosens, PUBLIC WORKS, October, 1957.

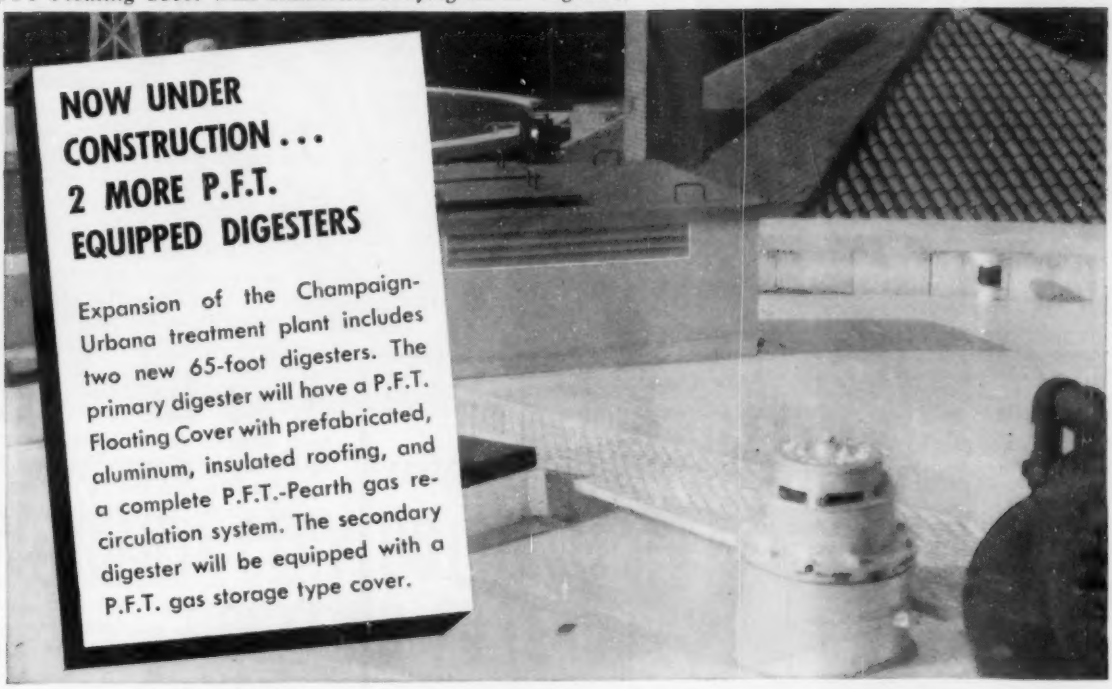
Preventive Sewer Maintenance

From the standpoint of good public relations, the maintenance of public sewers certainly pays big dividends. Proper maintenance insures the ability of the sewers to carry a constant flow without interruption. An effective maintenance program includes the following three items of prime importance: 1) Scheduled inspection; 2) routine operation; and 3) records of operation. The scheduled inspections are made

Watson Elected President of FSIWA

Kenneth S. Watson of Schenectady, N. Y., was elected president of the Federation of Sewage and Industrial Wastes Associations at a meeting of the Federation's Board of Control in Boston, October 6. Mr. Watson, widely known as consultant on water management and waste control for the General Electric Company, has held numerous important posts in the water supply and sanitary engineering fields. These included terms as chairman of the technical committee of the Interstate Commerce Commission on the Potomac River Basin, and as a member of the Ohio River Valley Water Sanitation Commission from West Virginia, his native state. He is a member and past chairman of the National Technical Task Committee on Industrial Wastes, a member of the American Water Works Association and of the American Institute of Chemical Engineers. His other posts, his honors and awards, make up a further imposing list.

PFT Floating Cover with aluminum roofing on 65′ digester.


NOW UNDER CONSTRUCTION . . .
2 MORE P.F.T. EQUIPPED DIGESTERS
Expansion of the Champaign-Urbana treatment plant includes two new 65-foot digesters. The primary digester will have a P.F.T. Floating Cover with prefabricated, aluminum, insulated roofing, and a complete P.F.T.-Pearth gas recirculation system. The secondary digester will be equipped with a P.F.T. gas storage type cover.

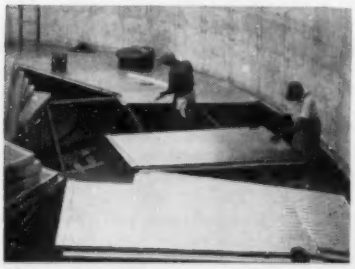
At Champaign-Urbana, Illinois . . .

A sewage plant invests in long-range economy

PFT metal roofing on new Floating Cover provides longer life, better insulation

With future economies in mind, the Champaign-Urbana Sanitary District specified a *PFT Floating Cover* with *metal-clad roofing* for their new 65′ diameter digester.

The metal roofing provides four distinct advantages over conventional wood types: (1) longer life—equal to the life of the Floating Cover, (2) more efficient insulation, (3) fewer maintenance problems, (4) easier assembly and installation.



Shown at actual installations, PFT metal sections are easily unpacked and assembled. Cardboard boxes in foreground contain panels as they are shipped.

Section of roofing showing (1) aluminum top sheet, (2) inch-thick fiber-glass insulation, (3) aluminum reinforcing channel, (4) corrugated supporting ribs.

PFT metal roofing consists of prefabricated sections with embossed aluminum top sheets, each piece marked for easy assembly at the plant site. The sections are designed for close fitting in the field with a 3″ lap of top metal covering at all joints (see illustration). Cutout sections are provided to fit around sampling walls, hatch framing, manholes, etc.

With fiber-glass insulation, PFT metal roofing resists heat loss and keeps digester heating costs at a minimum.

Ventilators are provided for the space between ceiling plate and roof deck. Also included is a 19″ wide walkway of galvanized steel, deformed for sure footing.

The PFT Floating Cover at Champaign-Urbana includes a complete *Pearth Gas Recirculation System*—an economical process that controls the formation of scum, making more effective use of the entire digestion tank capacity.

Design of plant by / *Wilson & Anderson, Consulting Engineers Champaign, Illinois*

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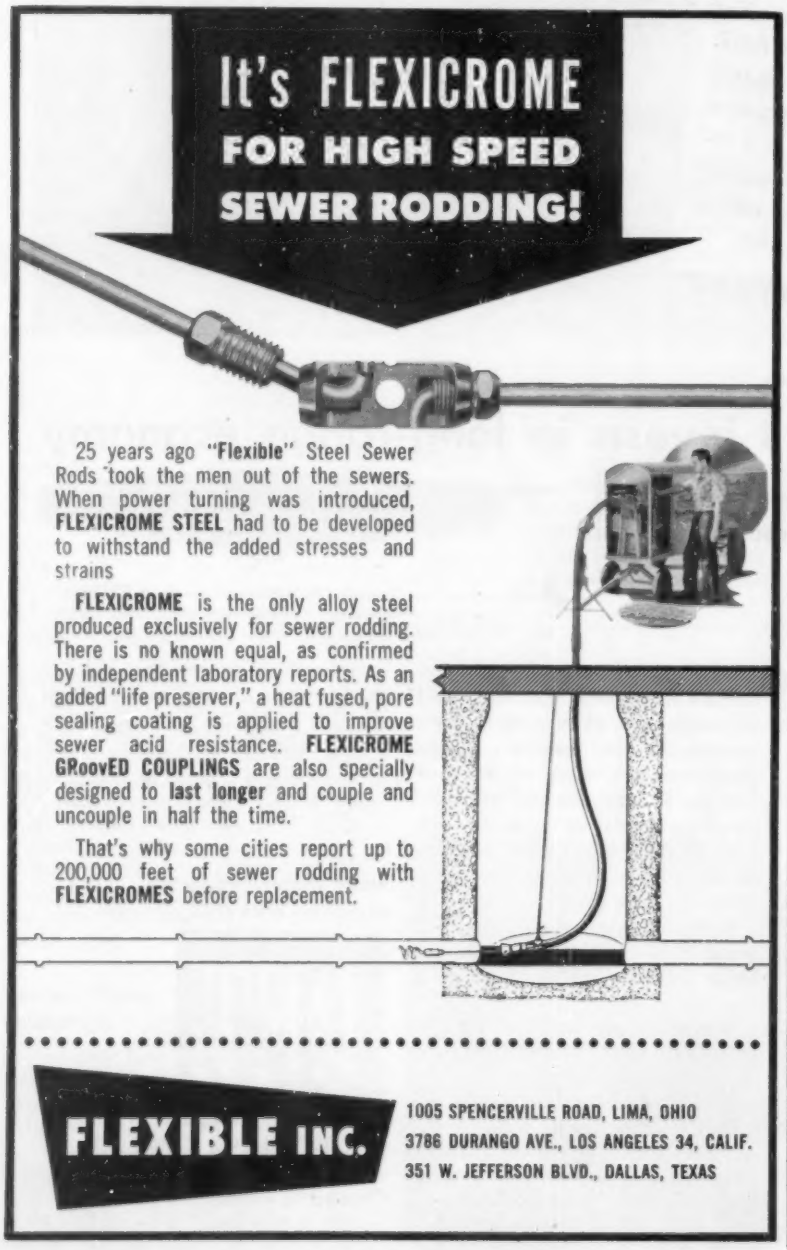
at the manholes to ascertain whether sewage flow is normal. If it is not, it may be found that root growth may be causing the stoppage or that the sewer gradients have changed causing a sluggish flow. These conditions should be corrected immediately to prevent more serious difficulties from arising, including the flooding of basements and damage suits. The operation plan for sewer maintenance is set up to cover, under normal conditions, one section of the public sewer system at a time. This eliminates unnecessary moving of equipment and loss of time. All work performed each year is recorded on a small-scale map of the entire sewer system by the use of a color legend. The flushing of dead-end laterals, the sewers cleaned with the bucket machine, the emergency calls, as well as all lines specifically rodded by the mechanical sewer scraper are all recorded. Since this program was inaugurated in 1952 the recorded number of emergency calls have dropped from 158 in 1952; to 112 in 1953; to 93 in 1954; to 81 in 1955; and to 58 in 1956. The cost of this maintenance program has not increased although the wage rate per hour per man did increase.

"Does Preventive Sewer Maintenance Pay Dividends?" By A. J. Wahl. PUBLIC WORKS, October, 1957.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Landfill Ends 50 Year Nuisance

Union City, Tennessee, in 1956, inaugurated a modern sanitary refuse collection and disposal program thereby ending 50 years of open dumping which have been the source of smoke, odors and an assortment of rodents. A Caterpillar D6 Tractor was purchased and placed in operation on the landfill. Two 16-yard and one 10-yard packer trucks were purchased for refuse collection. The two 16-yard trucks make two pick-ups each week in the residential section, working on Monday-Thursday and Tuesday-Friday schedules. The 3-man crews haul two loads each day to the landfill, covering 3,068 residential stops. On Wednesdays, two flat-bed trucks are used to collect refuse not readily handled by the packer trucks. A night crew, using the 10-yard packer truck, collects from the business district, covering each of the 350 commercial stops six nights per week, between the hours of 5 P.M. and 2 AM.. After 2 A.M., the streets are washed and swept in this section, thereby providing a thoroughly cleaned downtown area when the merchants open each morning. Containers in the business area must be approved by the Obion County Health Department. Pickup service charges for the business section vary from $1 to $6 per month. The landfill is operated according to good sanitary practice. Another 72 acres, adjacent to the present site, has recently been purchased providing sufficient area for landfill operations for another 25 years, the land being reclaimed and used for a park development.

"Sanitary Fill Ends 50 Years of Public Nuisance." By Charles Herman Scates. PUBLIC WORKS, October, 1957.

Other Articles

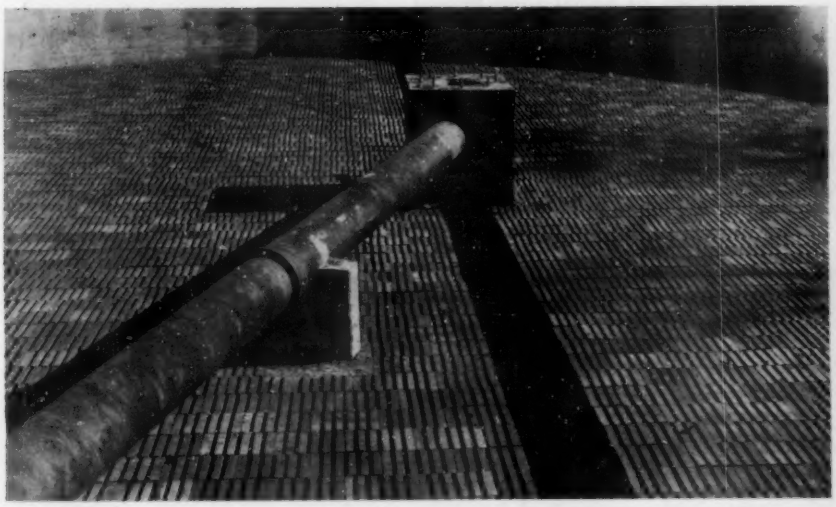
"Is Sterilization of Sewage by Irradiation Possible?" By David L. Narver. Civil Engineering, September, 1957.

"A Simplified Method of Incinerator Design." By H. G. Meissner. The American City, September, 1957.

"Nomographic Solutions for the Design of Anaerobic Digestion Equipment." By Walter R. Lynn. Public Works, October, 1957.

"Progress Report on the Sewage Treatment Construction Program." By Gordon E. McCallum. Public Works, October, 1957.

"Data on Refuse Collection and Disposal in Cincinnati." From the annual report of Ralph C. Taylor. Public Works, October, 1957.



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Vitrified clay TFFI specification blocks for trickling filter underdrain systems have advantages which designing engineers can count on. They are: (1) Infinite length of life, inherent in the clay. (2) Resistance to acids, alkalis, or other potentially harmful components. (3) Manufactured in an adequate plant under controlled conditions and in compliance with strict specifications. (4) Low cost. The cost of vitrified clay underdrains is such a small per cent of the cost of the filter that it "pays to be sure with clay." Tearing out a filter bottom later to replace blocks of any other material is too costly to be risked.

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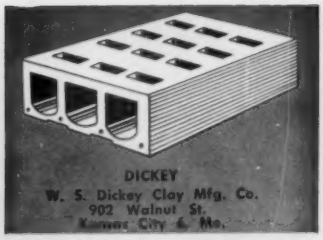

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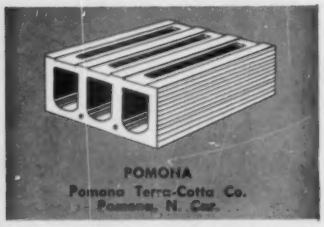
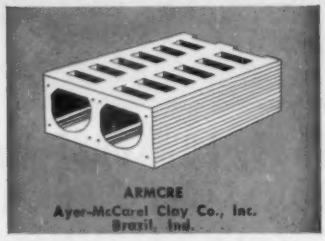


POMONA
Pomona Terra-Cotta Co.
Pomona, N. Car.



ARMCRE
Ayer-McCarel Clay Co., Inc.
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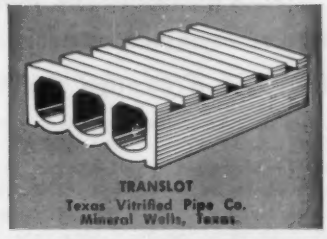

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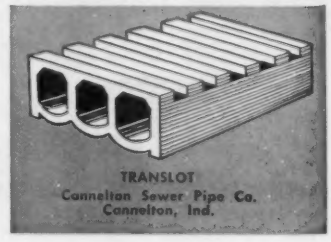

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Problems of Subdivision Homes

(*Continued from page* 89)

The above District has two problems in regard to proposed subdivisions. One is the development of proper tract drainage, the other is to set standards for proper ultimate size on existing outlet creeks or main channels for the various drainage areas. Certain areas cannot be developed in the flatlands until the outlet channels are improved to a 50-year design frequency. In such instances, tract drainage cannot function and would work in reverse, flooding homes and streets.

The County has a contract with the Contra Costa County Flood Control and Water Conservation District to approve the in-tract drainage for new subdivisions. The District checks surface and lot drainage for routine and special problems which may arise. The capacities of gutters and conduits is checked using the rational method with a 10-year design frequency for residential streets.

The primary function of the Construction staff is to see that essential planning is converted to reality. Since the final results from the work of all who have participated in the planning are dependent upon the efforts and the ability of the Construction Inspection Staff to assure proper completion, and since the taxpayer and homeowner have a large stake in the finished product, it is necessary that subdivision inspection be adequate and efficient.

To achieve the necessary control and to accept the responsibility entailed in subdivision work, the Construction Engineer:

1. Reviews the proposed subdivision when possible during preliminary stages both in the office and on the ground to determine the general construction problem.
2. Inspects work during all stages of construction to insure compliance with plans and specifications.
3. Maintains close liaison with Testing and Materials Division in all phases of construction.
4. Recommends necessary changes in plans to meet unforeseen field conditions.
5. Coordinates the diverse interests of the public, the subdivider, the contractors, the utility companies and others.
6. Reviews minutely the finished product.
7. Recommends acceptance through the Location Engineer.

The working functions of the Construction Division are in three fields: (1) Engineering inspection and administration; (2) field inspection

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and control; and (3) office records and liaison.

Processing Subdivisions

The following steps were laid down by F. R. Brown, Jr., Location Engineer, and are for: (a) Subdivision tentative maps and final maps; and (b) subdivision improvement plans, inspection and acceptance.

(a) For the Subdivision Tentative Maps:

1. The subdivider files twenty-four copies of the Tentative Map with the Planning Commission, together with a filing fee of $15. These copies are distributed to the County Departments and agencies concerned. The subdivision conference (optional) is scheduled.

2. The Location Division of the Public Works Department routes copies of the Tentative Map to the Traffic Division, the Sewage, Waste and Water Division, and to the Design Division, in the Public Works Department, for review and written comment, to be returned to the Location Division, prior to the subdivision conference. The Location Division transmits a summary of comments to the Planning Commission staff at the preliminary conference.

3. The Planning Commission staff holds the subdivision conference with representatives of the subdivider, County Departments, utility companies, school districts, community groups and other interested agencies, to discuss the proposed subdivision. The recommendations, if necessary, are later discussed with the subdivider and his engineer, and agreements reached if possible. The matter is then scheduled for the Planning Commission agenda.

4. The subdivider submits his revised tentative map, in accordance with approved recommendations for distribution as above.

5. The Planning Commission holds a hearing on the Tentative Map. Approval of the map is made with whatever conditions the Commission deems appropriate.

6. The subdivider submits a print of the final map to the Public Works Department for checking. The Map is accompanied by a fee of $20, plus $0.50 for each lot shown on the map.

7. The Location Division checks the map for accuracy of calculations, completeness of data, conformance with form of certificates, and conditions approved by the Planning Commission. Any corrections are transmitted to the engineer for the subdivider.

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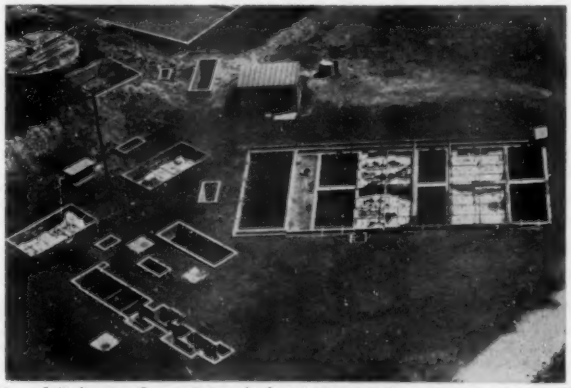
IDEAL for SMALL CITIES, SUBDIVISIONS, INSTITUTIONS



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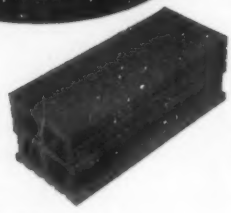

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8. Tracings for the final map are submitted by the engineer. The Location Division checks for completeness and correctness of map, certificates, signatures, proposed dedication of streets and easements for drainage and utilities. Supplementing documents checked (off-tract right-of-way easements, tax letter, tax bond, engineers' cost estimate, subdivision agreement and bond). The final map must be returned to the subdivider within fifteen days for presentation to the Board of Supervisors.

9. The Location Division collects required fees and deposits and issues receipts.

10. Subdivision Bonds are checked and approved by the District Attorney.

11. The Public Works Director signs the maps.

12. The map, agreements and bonds are transmitted to the Board of Supervisors for approval. The Chairman of the Board executes agreements. The County Clerk signs the map.

13. Right-of-way documents are transmitted to the County Right-of-Way Agent for recording.

14. The Title Company submits map and letter of title to the County Recorder for recording of map.

Note: Improvement Plan Review is made concurrently with the processing of the final map, and this review follows: the Improvement Plans are approved by the Planning Commission before the final map is approved. If improvements are completed, in accordance with approved plans, and under County Inspection, before the final map is submitted, the agreement and subdivision bond are not required.

(b) For the subdivision improvement plans, inspection and acceptance:

1. The subdivider submits improvement plans to the Location Division for distribution to and review by the Flood Control District, Planning Staff, Traffic Division and Sewage Waste and Water Division. Any corrections are given to the subdivider's engineer by the Location Division.

2. The subdivider submits laboratory tests on subsoil and materials for street design, obtained by commercial testing laboratories.

3. The Design Division obtains traffic design volume data from the Planning Commission staff and from the Traffic Division and furnishes structural pavement design to the subdivider.

4. The subdivider submits revised improvement plans for ap-

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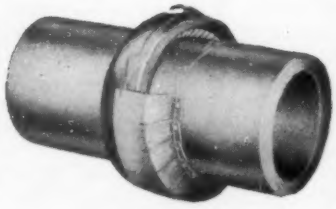

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proval by Planning Commission, Flood Control District, and the Public Works Department. Also submitted is his engineer's estimate of cost of improvements.

5. The Planning Commission holds hearing on improvement plans.

6. The subdivider pays a flat, total inspection fee which is three percent of the cost estimate of improvements. This provides for simple accounting procedures.

7. Approved improvement plans are forwarded by the Location Division to the Public Works' Construction Division, the subdivider's engineer, and the Flood Control and Water Conservation District Engineer.

8. Inspection of the subdivision improvements is made by the Construction Division, at the request of the subdivider, during various stages of construction. This work includes curb, gutter, sidewalk, street work and drainage installation. Water, gas, and telephone are checked by the respective utility companies. Sewers are generally constructed under the direction of the Sanitary District in the area or under Public Works Department inspection if the sewers are located within a County Sanitary District.

9. Requests for revision in approved plans are channeled through the Location Division which co-ordinates requests and sub-request approvals with all concerned.

10. Subdivider's engineer submits a certificate as to installation of monuments. Random, spot checks are made by Public Works Department's field crews.

11. The request for final inspection of the subdivision improvements is made by the subdivider, or his engineer. Inspection is made by the Construction Division, and where applicable, also by the Flood Control and Water Conservation District. Reports of inspection are forwarded to the Location Division with copies for the subdivider.

12. The Board of Supervisors accepts streets as County Roads, when all the improvements are completed, upon recommendation of the Public Works Director.

13. The subdivider submits a letter from the Title Company as to filing of liens, after ninety days have passed, subsequent to acceptance of streets by County (taken as effective date of completion).

14. The Public Works Department recommends exoneration of improvement bond by Board of Supervisors.

Note: An increasing number of subdivision improvements are being financed by assessment proceedings, as outlined in California State Law. In such cases, additional administrative steps, which will not be discussed here, are required. In such situations, it is imperative to have the advice of an attorney, preferably one well versed in such proceedings.

Conclusion

We have attempted to outline the steps in developing a subdivision in Contra Costa County's unincorporated area, pointing out highlights of basic laws, the controlling local ordinance and pertinent policies from the engineers' point of view.

Many counties, with subdivision problems, may not have separate organizational units, such as the Traffic, Materials and Testing, Location, and Construction Divisions, which are set up in Contra Costa County's Public Works Department. However, the functions performed by these Divisions in the complicated subdivision process must be taken care of in accordance with the needs of local areas. One man may do the whole job in one jurisdiction; several may be too few in another. We hope the subdivision process we have outlined will be of interest to public engineering organizations that work with this field.

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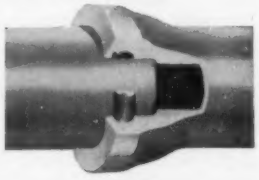

Photograph above shows use of the Fork Tool to push plain end of pipe into the Tyton socket. On sizes 2" and 2¼" to 8", you may also use a crowbar anchored in bottom of trench and pushing against bell-end. Only joint accessory is the Tyton gasket. Eliminates bell holes, reduces pipe line construction time and costs. Joint is flexible and will withstand pressures exceeding those required by standard cast iron pipe specifications. Joint approved by ULI in 4" and larger sizes. Pipe is standard McWane Super DeLavaud, centrifugally cast. Prompt shipment. Write for Tyton Joint folder.

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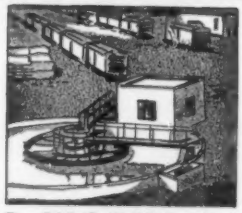


PUBLIC WORKS DIGESTS

Prepared by
CLAYTON H. BILLINGS
Associate Editor

THE INDUSTRIAL WASTE DIGEST

Pilot Plants for Paper Mill Wastes

Activated sludge treatment appears to be best for reducing the oxygen demand of pulp and paper effluents. Pilot plants have been operated for handling these effluents by conventional activated sludge treatment and the contact stabilization modified method, with organisms developed from the waste meterials supplemented with nitrogen and phosphorous. In the contact stabilization process, active sludge and raw wastes are aerated for relatively short periods, during which time most of the BOD is absorbed by the floc particles, later removed in a clarifier. Settled sludge is then aerated for longer periods in a stabilization tank. The BOD loadings ranged from 43 to 585 lbs. per 1000 cu. ft. of aerator capacity, attributable to the relatively high suspended solids concentration carried in the aeration tanks and to the generally high temperatures prevailing in mill wastes. The latter are factors in paper mill waste treatment, and biological oxidation proceeds approximately six times as rapidly at 105°F as at 32°F. Chemical neutralization might be necessary if peaks of pH are violent or frequent. Sludge disposal is probably the most critical remaining problem.

"How to Treat Paper Mill Effluents by Controlled Bio-Oxidation Methods." By Dr. Nicholas J. Larderi, National Council for Stream Improvement. *Wastes Engineering*, September, 1957.

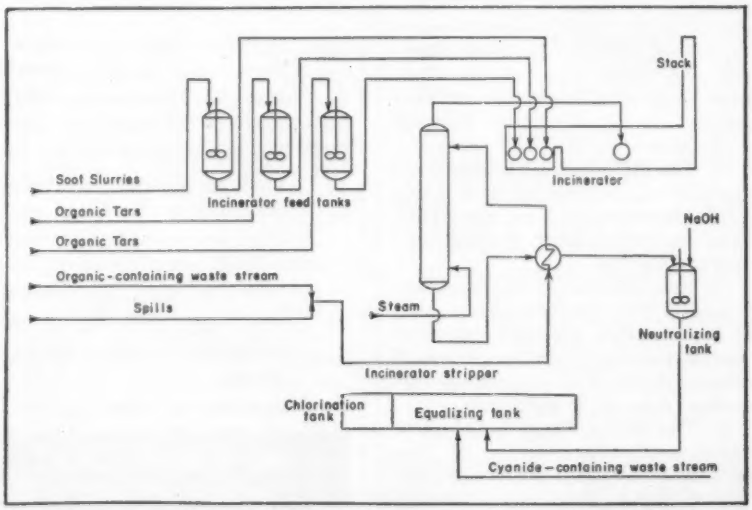
Incineration of Organic Wastes

In the manufacture of acrylonitrile and vinyl chloride at its plant at Texas City, Texas, the Monsanto Chemical Co. was faced with the problem of disposing of liquid wastes containing hydrogen cyanide, organic cyanides, still residues from acrylonitrile and vinyl chloride processing units, and wettable and non-wettable soot from acetylene manufacture. In order to chlorinate the hydrogen cyanide wastes to the cyanate stage at alkaline pH levels and still control the process on a chloramine residual basis, it was necessary to remove the acrylonitrile present by steam stripping. Laboratory work showed that the uncondensed overhead from steam stripping could be incinerated at temperatures above 1000°F, and that this would completely oxidize cyanides present. A multipurpose incinerator was consequently designed to burn wettable and non-wettable soot, organic residues containing nitrogen and chlorinated compounds, and a low-concentration organic-bearing aqueous stream. The design was selected with the aid of Nichols Engineering and Research Corp. It was decided to slurry the dry soot stream in No. 2 fuel oil to facilitate its transfer to the incinerator and to supply part of the fuel necessary. Natural gas was chosen as the secondary fuel. Optimum temperatures arrived at to avoid appearance of soot in the stack gases are 1500°F in the combustion zone and 1200°F in the oxidation zone, which will lead to an average breech temperature of 1050° F. and average stack temperature of 750°F. The reaction or sojourn time necessary to destroy soot particles was determined to be 2 seconds. The incinerator uses 300,000 to 500,000 cu. ft. of natural gas per 24 hrs. Loadings average 24,000 gpd of soot-water slurry, 1,700 gpd of soot-oil slurry and 2,500 gpd of organic residues.

"Multipurpose Incineration Is Recommended by Monsanto for Pollution Abatement." By J. T. Garrett. *Industrial Wastes*, September-October, 1957.

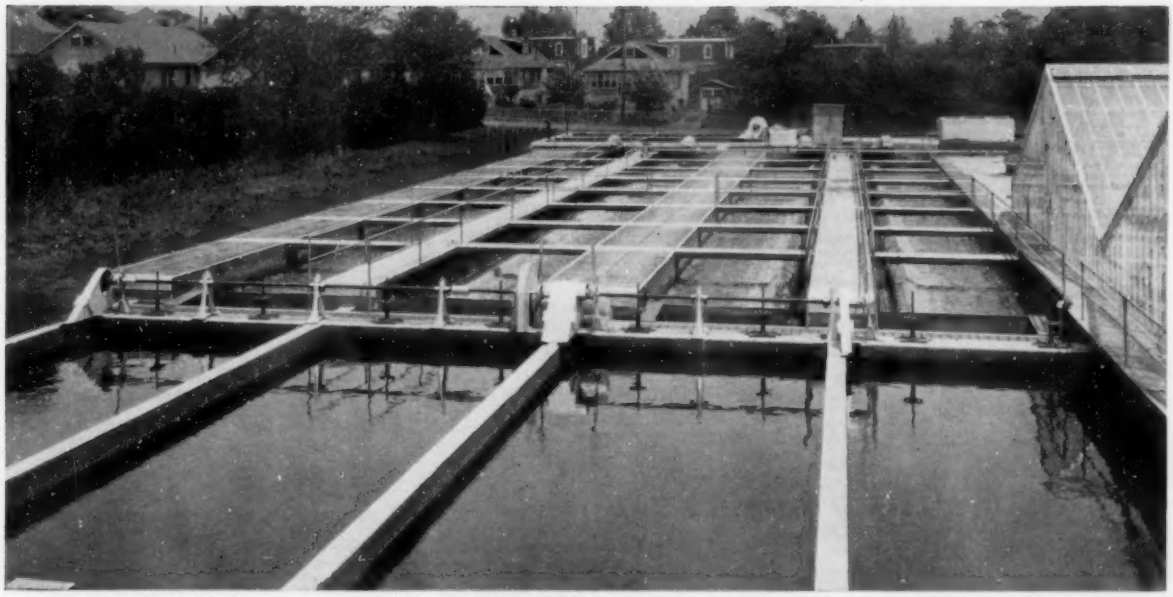
Fundamentals of Bio-Assay Procedures

In the solution of industrial waste problems, resorting to a search of the literature for toxic limits of the chemicals concerned is generally not productive of satisfactory results and quite often such information may be misleading. Many wastes are chemically complex, and separation of components may be difficult. Toxicants may be present which, when mixed, produce entirely different results than when present alone. The bio-assay solves the problem because it can be used to evaluate directly the toxicity of

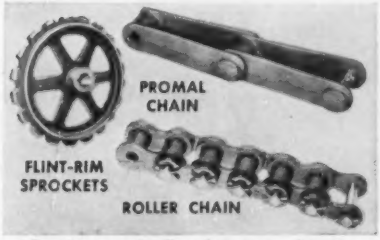


Courtesy Industrial Wastes

● **FLOW DIAGRAM of incinerator and waste feed units at Monsanto plant.**



FOR 15 YEARS, Link-Belt chain on final tank Straightline Collectors at this activated sludge plant rendered dependable service without replacement, operating 24 hours a day. At other plants, Straightline Collectors have been in operation for a quarter century without replacements. Clearness of effluent may be judged by reflection of drive machinery in final tanks in foreground.



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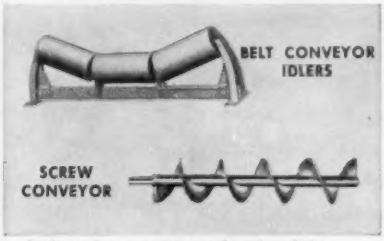

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chemically complex wastes. Toxicity of the same or similar wastes may vary widely in different receiving waters. Among factors which influence toxicity of a waste to fish are temperature, dissolved oxygen, carbon dioxide, pH, alkalinity, hardness, synergy, and antagonism. The toxicity of metal salts may be greatly influenced by pH, alkalinity, and hardness. While moderate concentrations of some minerals in sea water and highly mineralized fresh water are harmless to fish, when they occur alone or in physiologically unbalanced solutions, they can be injurious. In general there are only three main water quality criteria which can be assigned numerical values applicable to extensive areas; temperature, dissolved oxygen and pH. Briefly the bio-assay procedure recommended by the subcommittee on toxicity of the FSIWA consists of preparing concentrations of an effluent with a selected dilution water, adding the test fish and observing their reactions over a definite time period. From the observed mortality in the different concentrations, median tolerance limit values are estimated. The test fish should be a species adaptable to the laboratory conditions of temperature, feeding and handling. The recommended diluent for preparing test concentrations is water from the receiving stream or lake, just upstream from the effluent outlet. The average industrial analytical laboratory is suitable for conducting bio-assays. In sampling, the nature of the plant operation and the physical character of the receiving water determine the best procedure. Certain physical and chemical determinations should be made on each concentration in the series during the course of a bio-assay. Where effluents cause oxygen depletion, it may be necessary to add air or oxygen to maintain the dissolved oxygen concentration in the test solutions at levels required for fish survival.

"Bio-Assays for Control of Industrial Effluents." By Croswell Henderson and C. M. Tarzwell, Robert A. Taft Sanitary Engineering Center. *Sewage and Industrial Wastes*, September, 1957.

Harbor Marine Life Studies

Sampling of marine life in the Los Angeles-Long Beach, California harbors after dredging operations has provided knowledge of non-pollution conditions, broadening the basis for conclusions on the effect of subsequent pollution. The time required for degradation of a harbor can be obtained by studying dredging activities in polluted areas. The bottom dwelling animals will change providing the new substrate in the harbor bottom has been exposed. During the period 1951 to 1955 an average of 10 mgd of wastes was discharged into an area subjected to monthly sampling. The largest part of the waste discharge consisted of oil refinery wastes; also included were wastes from rubber processing and Transite pipe manufacturing. Domestic sewage reached the area from septic tanks serving business houses and from toilets in yacht anchorages. The organic carbon content, of the substrate, which varied from 0.6 to 10.7 percent, with the higher figure near points of waste discharge. Increasing carbon content was noted in dredged areas. An increase in the number of species of bottom-dwelling animals occurred shortly after dredging. During each subsequent survey the number was shown to diminish. The bottom conditions were in equilibrium about a year after dredging.

"Effect of Pollution on Marine Life." By D. J. Reich, U. of Southern California. *Industrial Wastes*, September-October, 1957.

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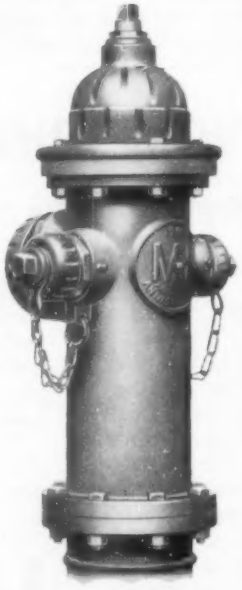

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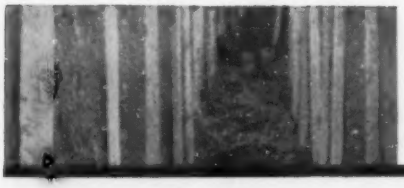

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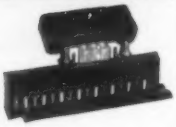

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Waste Prevention Techniques

One of the major industrial waste control measures is waste prevention. A change in a process or the processing materials often prevents waste at the source, either completely eliminating the waste or substituting a material requiring a much lesser degree of control. To eliminate cyanide materials, many General Motors Divisions have changed from cyanide copper plating solutions to acid copper solutions. Some have installed "shot blast" or abrasive equipment for use in place of the sulfuric acid pickling of steel. Alkaline derusters are being used in place of acid solutions for removing light rust. There are many solutions that have not lent themselves to process substitution or modification. These should be maintained in a closed system, which requires measures to extend the life of solutions. Such measures include removal of suspended materials, prevention of bacterial action, removal of chemical products and foreign ions, and solution control. Ion exchange systems have many applications, particularly in recovery of materials to maintain a closed system. Effective maintenance of equipment plays an important part in waste prevention through reduction in the loss of materials. Although waste prevention methods are employed in General Motors Divisions, there remains a considerable volume of industrial waste solutions which are treated. Recently completed facilities for treatment have been installed at the AC Spark Plug and Buick Motor Divisions at Flint, Mich., the Pontiac Motor Division at Pontiac, Mich., and the Ternstedt Division, Columbus, Ohio.

"Industrial Waste Control in the General Motors Corporation." By Lynn Davies, Production Engineering Section, General Motors Technical Center. *Sewage and Industrial Wastes,* September, 1957.

New Ion Exchange Techniques for Wastes

Solvent extraction techniques used in the production of uranium concentrates have effected interest in applying them to other problems. The technology is primarily ion exchange in character and is becoming more commonly referred to as liquid-liquid extraction processes. The liquid extractants employed exhibit properties of selectivity similar to ion exchange resins. The same is true of the properties of sensitivity to pH, of being subject to "crowd-

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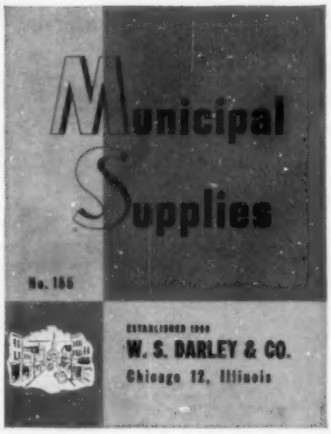

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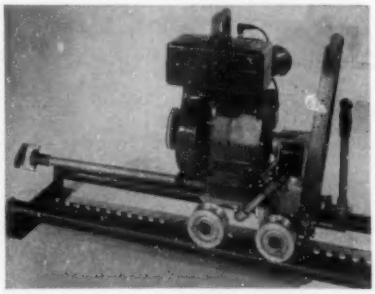

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ing" in ion displacement procedures, and of being subject to similar loading and eluting behavior. Among the liquid cation exchangers are organo-phosphates. Anion exchange liquids include a number of amines, ranging from primary to tertiary forms. The liquid extraction process possesses advantages of continuous flow and balanced hydraulics as contrasted with the ion exchange resin system. While the newness of the process has not permitted the development of specific data on its application to industrial waste problems, it is hoped that interest will be stimulated.

"Liquid-Liquid Extraction for Ion Exchange Recovery or Treatment of Industrial Wastes." By C. J. Lewis, Colorado School of Mines Research Foundation. *Industrial Wastes,* September-October, 1957.

Other Articles

"The Industrial Effluent **Problem in Britain.**" By John Finch, Slough, England. A symposium on trade wastes held at Birmingham for representatives of industry and government to help solve the problems that are becoming overwhelming. Water and Sewage Works, September, 1957.

"Treatment of **Petrochemical Wastes** at Port Lavaca, Texas." By R. L. Wright, Union Carbide Chemicals Co. A case where management of an industrial firm takes unusual interest in predicting waste disposal needs and providing for future expansion results in a high degree of flexibility of operation. Sewage and Industrial Wastes, September, 1957.

"Pennsylvania **Milk Waste Treatment** Methods." By C. L. Siebert, Jr., Pennsylvania Dept. of Health. The application of various waste treatment methods including aeration, digestion, trickling filter treatment and disposal by irrigation are reviewed. Sewage and Industrial Wastes, September, 1957.

"**Ion Exchange** Treatment of Industrial Wastes." By Charles G. Bueltman, Manager, Industrial Waste Treatment Dept., Permutit Co. Ion exchange methods are finding numerous applications in waste treatment and usually are employed to economic advantage where other unit operations, evaporation or precipitation are not feasible. Sewage and Industrial Wastes, September, 1957.

• • •

Work on National Highway System

The Bureau of Public Roads reported that, during the month of August, contracts were advertised for 246 miles of construction on the Interstate System, estimated to cost about $105 million. Nearly $70 million worth of contracts were awarded, for 156 miles of construction, and over $72 million were authorized for surveys and plan preparation and acquisition of right-of-way.

In the 14 months since passage of the Federal-Aid Highway Act, over $2.7 billion has been programmed for improvements to the Interstate System, of which nearly $2.3 billion was Federal-aid funds. Construction contracts under way or soon to start amount to more than $1.1 billion (including $982 million Federal aid) and cover 2,151 miles.

NEWS OF ENGINEERS

WILLIAM L. O. MARTINI has been appointed the first Director of Public Works of Glendale, Calif. He has been City Engineer for ten months and has been with the City Engineer's office for 32 years. The vacancy in the City Engineer's position will be filled by E. W. HOLLAND, who has been Superintendent of Buildings since 1954 and prior to that time was an employee in the City Engineer's Office. RALPH R. ROBISON becomes Street Superintendent after serving as Assistant Street Superintendent since 1950.

H. E. HUDSON, Jr., has become a member of the firm of Hazen and Sawyer, Consulting Engineers of New York City and Detroit.

Demonstration of the weight capacity of an 80-foot Atlas crane at the annual Shade Tree Conference in Philadelphia. This crane was purchased by Harry Turner, Shade Tree Commissioner for the City of East Orange, New Jersey. *Write us today for information on the many uses of Atlas Cranes.*

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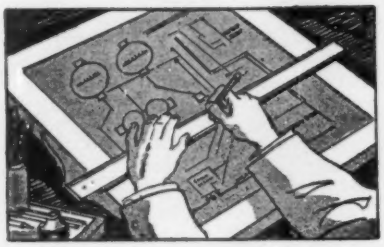

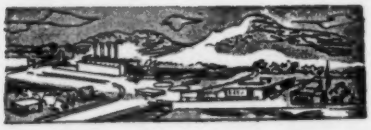

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Composting in India

(*Continued from page* 99)

The average nitrogen value (dry solids basis) of the Bangalore compost was reported to be 2 percent, while that of the Indore compost was 1 percent. This difference is due to variation in the composition of refuse and night soil collected from different areas of the city, rather than differences between the two processes. The finished compost from both processes has the appearance of well stabilized humus. Primarily a soil builder, the compost is also used for its nitrogen value by farmers, due to the general lack of nitrogen from other sources in India. The finished compost is loaded and hauled by farmers in country carts, who pay about 31 cents per load of 40 cubic feet for the Bangalore compost and proportionately less for the Indore compost. The annual revenue from the sale of compost averages about $5,250. The cost of the operation is not known, but the cost of the Bangalore process should approximate that of a sanitary land fill operated with hand labor, so from this standpoint the revenue is pure gain. Due to higher cost of construction and operation, the Indore process is looked on with less favor by local management and its economic advantages are questionable in spite of the low wage level (about 32¢/day).

In view of the high nitrogen value of night soil, there may be considerable nitrogen loss in both processes, but part of the apparent loss may be due to the relative shortage of night soil, preventing placement of the full design quantity in the mix.

Health Hazards

The Health Officer of Indore reported there was no public health problem created by the agricultural utilization of the end product from either process. It may be surmised that all pathogens except possibly *Ascaris* eggs (round worm) are destroyed due to the combined effects of time, temperature, physical changes in the material and microbiological competition. Although the Indore process is shorter in time, it is presumed that resistant eggs would be more apt to be killed in the Indore process than in the Bangalore process, due to higher temperatures. As regards Ascariasis transmission, the eggs may either be destroyed in the process, the method of utilization may not favor transmission to man, or limited trans-

mission of this rather innocuous infection may actually take place but pass unnoticed by Indian public health authorities due to more pressing problems and lack of personnel.

Applicability to the United States

The Indore or Bangalore processes and their modifications, are considered to have limited applicability in this country, but might be useful in special situations. Municipal refuse alone as a source of compost provides a useful soil-building material; in combination with raw sewage sludge it has added plant nutrient value. Aerobic thermophilic compost is considered to be potentially more suitable for cities, with the simpler semi-anaerobic processes described in this article being more suitable, according to Gotaas,[1]

[1]Gotaas, H. B. (1956). Composting—Sanitary Disposal and Reclamation of Organic Wastes. World Health Organization. ppbd. 205 pp. $5.00.

for villages and towns. Some residential communities have very large areas of public parkways, golf courses, etc., in proportion to housing areas. The casual, informal use of digested sewage sludge in green areas of this type which are not used as picnic or playgrounds is more extensive than is generally realized. Semi-anaerobic compost derived from domestic refuse, with or without sludge, should be a better soil-builder than most sewage sludges; with sludge it should have more satisfactory nitrification and fertilizer values. The use of compost for public purposes circumvents marketing problems. The Bangalore process is adaptable to the use of light mechanical equipment with minimum handling, but the need for removing uncompostable materials from the refuse would tend to complicate the process in this country.

A more complete discussion of all types of composting processes will be found in the reference cited.

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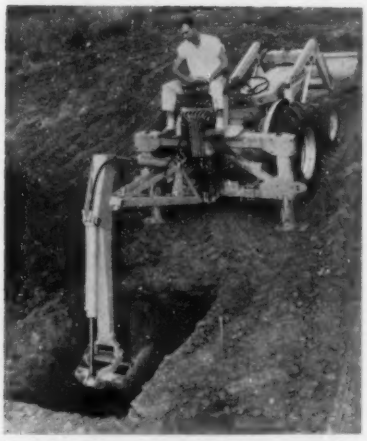

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Keep out snow and cold with this cab

All-Weather Cab For Tractors

The J. Frank Sims Cab Co. has announced the manufacture of an all-weather cab for use on International, Ford, Fordson Major, Case, Minneapolis-Moline, John Deere and Oliver tractors. The cabs are designed to fit either the bare tractor, or tractors equipped with most combinations of front and rear-mounted equipment, such as loaders, backhoes, dozers, brooms, snow plows, post hole diggers, mowers, scrapers, cranes or trenchers. Operating controls may be mounted inside the cab to allow full use of the tractor in all weather, the year around. The cab is roomy for comfortable operation and allows complete visibility in all directions, including upward through the large safety glass windshield and sky-light. Safety glass meets all state highway safety regulations. Full details from the J. Frank Sims Cab Co., Box 98, Holden, Mass., or circle **No. 11-5** on the reply card.

Portable Truck Winch

A portable truck winch operating off the power of the truck storage battery without alteration of the truck's electric system has been introduced. The winch has a 1,000-lb. pulling capacity and is operated by one man at a rate of 5 ft. per minute. It is adaptable to many uses, and the shipping weight is only 106 lbs. For details write the Hoist Division of Burtchaell Heating Co., 2944 S. E. Powell Blvd., Portland 12, Ore., or circle **No. 11-6.**

Four-wheel drive Chevrolet pick-up for off-road operation

Econ-O-Packer refuse bodies range from 20 to 36 cu. yds.

Construction and Maintenance Trucks

An expanded, widely diversified line of 1958 trucks featured by a new 348-cu. in. V8 of 230 hp., many chassis improvements, and more powerful and durable sixes and V8's is announced by Chevrolet. Major interest is the addition to the line of nine new medium-duty cab-chassis models. Six, including three low cab forwards, carry 72-in. cab-to-axle dimensions for more ideal weight distribution in trailer operations. Three new models have a 124-in. cab-to-axle dimension to accommodate 16-to-19 foot bodies. Design gives distinction to models in each weight class, although frontal styling of all models is substantially similar except for the Step-Van. Modern dual headlamps extend low beam visibility up to 50 feet further. For further details write Chevrolet Motor Div., General Motors Corp., General Motors Building, Detroit 2, Mich., or circle **No. 11-8** on the reply card.

Refuse Collection Bodies With Front-End Loaders

Refuse compacting bodies in capacity ranges from 20 cu. yds. up to 36 cu. yds. are available from S. Vincen Bowles Co. The low loading mechanical loaders are either front or side loading. They handle detachable containers as well as attached collection containers. For full details write S. Vincen Bowles Co., 12039 Branford, Sun Valley, Calif., or circle **No. 11-10** on the reply card.

Portable Space Heater

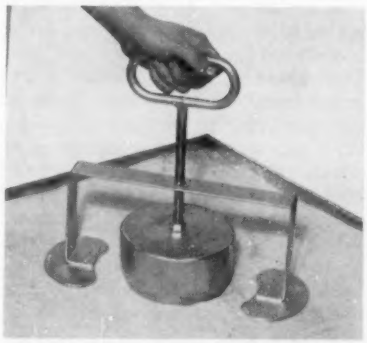
Manufactured in 120,000; 200,000; and 300,000 btu sizes, the Champ-Heater 16, announced by Champion Mfg., has three exclusive features besides its easy portability. These exclusive features are: 16 hours burning capacity—no night attendant needed; Underwriter-approved Sunstrand motor and burner; and complete combustion for odorless, fumeless operation. For more information about this unit, write Champion Mfg. Co., 2028 Washington Avenue, St. Louis 3, Missouri, or circle **No. 11-7** on the reply card.

Digging Done By Remote Control

Digging by remote control has been demonstrated by a 54 "F" Model Sherman digger. In remote control digging, a power line from a device with push button controls permits the operator to do a precision digging job from a distance of more than 30 feet from the digger. The unit mounted on a Ford Tractor is designed for fast digging and long life and has a breakaway capacity of 9000 lbs. Another factor is the pump drive from the tractor PTO at the rear, which through a Sherman planetary step-up transmission develops greater digging speed. The Sherman "F" can excavate a trench 15 feet 8 inches long from just one tractor position. The arc of swing is 188 degrees, the reach below grade is 12 feet, and the loading height, 9 feet, 2 inches. The unitized operator's seat and control panel provides comfort with excellent unrestricted visibility. The seat is adjustable for various arm and leg lengths and the full, anti-skid deck permits the operator to change his leg position at will, which greatly lessens fatigue. The digger can be dismounted from the tractor or mounted in a matter of minutes. For more information write Sherman Products, Inc., Royal Oak, Mich., or circle **No. 11-9.**

Ball Penetration Apparatus For Concrete Slump Measurements

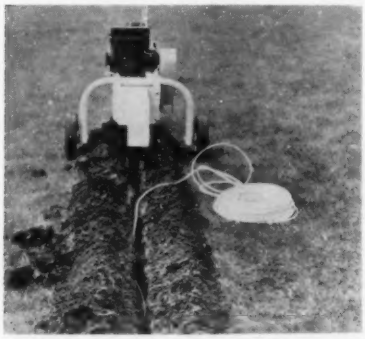
This apparatus, a new instrument for determining the slump of fresh concrete, is now available from Soiltest. It is made in accordance with ASTM specification C-360, ball penetration in fresh portland cement concrete. It consists of a cylinder with ball shaped bottom and a handle weighing 30 pounds. A lightweight metal frame guides the handle and serves as a reference for measuring the depth of penetration of the ball. Fresh concrete may be tested either as placed in forms or in a suitable container. For further details write Soiltest, Inc., 4711 W. North Ave., Chicago, Ill., or circle **No. 11-11** on the reply card



No experience is necessary to operate the device for the concrete slump test

Automatic Trenching Machine

An automatic trenching machine that literally saws through hard ground makes it possible to lay plastic pipe with a minimum of torn-up ground. The new ground saw trencher developed by Cosom Engineering Corp. is particularly useful for installing lawn sprinkler systems and underground cold water pipe. A clean trench 2¼-inches wide in tough soil is laid even where hand trenching would be virtually impossible. Three models are available that trench to depths of 12, 18 or 24 inches. The new machines have 2¾-hp Briggs & Stratton engines with a six to one gear reduction, and a fully enclosed drive. The machine can be operated at speeds up to three feet per minute and it



Machine is useful for installing lawn sprinkler systems and cold water pipe

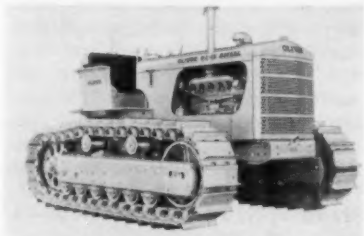
rolls on 10-inch semi-pneumatic tires across lawns without damaging the turf. The 12-in. and 18-in. models are 53 inches long, and the 24-in. model 59 inches. Each weighs approximately 160 pounds. For more details write Cosom Engineering Corp., Minneapolis, Minn., or circle **No. 11-12** on the reply card.

Steber Fluorescent Area Floodlights

The all aluminum streamlined design of the new Steber Series TFL fluorescent area floodlights provides minimum weight, low wind resistance and trouble-free service. An especially designed mounting clamp provides universal aiming on both single and dual installations. All wiring is fully enclosed in a splice compartment and ballasts are externally mounted. The units are designed for maximum utilization of high output rapid start power groove and VHO lamps. Each unit accommodates two 48-in. fluorescent tubes which are provided with individual deep parabolic snap-out inner reflectors. Light is not trapped between lamps and there is full control over the output of each tube, resulting in a narrow more efficient beam. Series TFL units can be furnished with or without plexiglass extruded doors and with or without tubes. Single and dual mounting arms are also available. Complete information from Steber Manufacturing Co., Broadview, Ill., or circle **No. 11-13** on the reply card.

Diesel Crawler Tractor

Another new crawler tractor takes its place in the broadened Oliver line with the production of the Model OC-15. A high-torque, 6-cylinder diesel of 529-cu. in. dis-



Tractor has four forward gear speeds

placement delivers 75 drawbar hp. The unit has four forward gear speeds ranging from 1.67 to 5.60 mph providing good speed selection. Air steering, which is standard, gives instant response resulting in sustained high production and operator efficiency. Details are available from the Oliver Corp., 400 West Madison St., Chicago 6, Ill., or circle **No. 11-14** on the reply card.

New Powerful Backhoe

The new model WR-350 backhoe, for mounting on International Harvester 300-350 utility tractors, has just been announced by Wain-Roy. Increased speed and power, plus greater loading height, enables this new backhoe to handle a wider variety of difficult trenching jobs, utility trenches and service lines. A digging range of 190 degrees, a dig-

Backhoe can handle difficult trenching jobs in a wide variety of applications

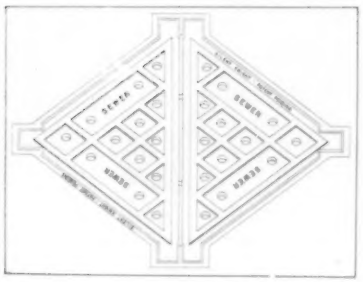
ging depth of 12 feet below grade, and loading height of 9 feet combine to make the backhoe a versatile attachment engineered to operate profitably under the most cramped conditions. A strong subframe provides a mounting for backhoe, loader, dozer blade, mower and other useful attachments. The hoe is a complete self-contained unit and can be quickly and easily attached or detached—4-pin mounting, 2 hose connections. Complete information from Wain-Roy Corp., Hubbardston, Mass., or circle **No. 11-15** on the reply card.

Utility Spray Tank

The Littleford Model 101 utility spray tank combines three operations in one unit—bar spraying, with the standard 10-ft. tubular bar with shifting mechanism or 8-ft. mechanically operated full circulating bar; hand spraying; and pouring pot patching. It is adapted to repairing rural roads, patching city streets, and spraying driveways and parking lots. The operation of the unit is so simple that an unskilled operator can be checked out on it with a minimum of instruction. It is available as a truck mounted or a trailer unit. For complete specifications write Littleford Bros., Inc., 453 E. Pearl St., Cincinnati 2, Ohio, or circle **No. 11-16** on the reply card.

Littleford Model 101 utility spray tank being used on street maintenance project

No Noise Under Traffic Manhole Cover



Manhole cover cannot fall through the circular hole in the brick or masonry

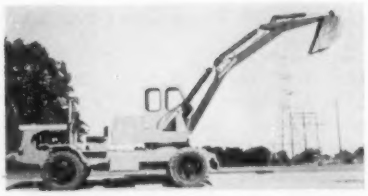
A manhole cover that does not rattle under traffic and is no problem with resurfacing has been announced by Silent Knight Co. The square lid is split on the diagonal to provide two triangular halves and cannot fall into the manhole. Employing the three point support principle, each lid rests with complete stability on its corners. The lid is designed to center over 24 and 30-in. diameter openings in either masonry or pre-cast concrete manholes. Lids are easily removed and replaced by one man with a pick or hook. For detailed drawings and specifications write The Silent Knight Co., 1614 N. Dixon Circle, Cincinnati 24, Ohio, or circle **No. 11-17** on the reply card.

Traffic Tie-Ups Are Unsnarled With Taller & Cooper's "CAT"

A "Confirmed Automatic Control" system that can divert, stop or change the direction of traffic on multi-lane roads to prevent highway tie-ups and allow free passage of emergency vehicles has been announced by Taller & Cooper. With CAT's modernized system, older roads and highways are able to cope with heavy traffic problems without difficulty. The big feature is the self-checking—which is done by a communications technique called multiplexing. It permits execution and confirmation of a command in less than two seconds. Other valuable parts of the system are its four safety factors: mechanical and electrical interlock, self-checking and confirmation. Every part of the system has checks and balances to protect against human and mechanical error. For more information write Taller & Cooper, Inc., 75 Front St., Brooklyn, N. Y., or circle **No. 11-18.**

Mobile Hydraulic Excavator Crane

Featuring a completely hydraulic operated crane with 360° swing, continuous rotation left or right, and road speeds up to 40 mph, the model B-4 Hydra-X-Cavator-Crane announced by Davis Engineering is used in construction and maintenance operations. With a turning radius of 17½ feet, the unit can be maneuvered in close quarters and the backhoe attachment has a digging depth of 11½ ft. and the ability to load high-sided trucks. Besides the ⅜-cu. yd. backhoe, attachments available include shovel, crane, clamshell, grapple, ditch cleaner and catch basin cleaner. It is powered by a Continental 6-cyl. engine. Complete specifications from Davis Engineering Inc., Benton Harbor, Mich., or circle **No. 11-20.**



Pick-Up Truck With Six-Passenger Cab

The Travelette, a pickup truck with six-passenger cab, has been introduced as a combination passenger-cargo carrier by International Harvester. It is available on a 129-inch wheelbase chassis in the models A-110, A-112, A-120, A-122 and the four-wheel-drive model A-120 (4x4), and will handle up to full ton loads. The cab has a full width rear seat accessible through a third, curb-side door. The six-foot pickup body is 54½ inches wide, 49½ ins. between wheelhousings; 90-inch load-carrying length is obtained from the front of the body to the rear of the lowered tailgate. Standard engine is the 141-hp International Black Diamond 240. Designed to transport personnel or material, the Travelette will meet many transportation needs in numerous fields, including public utilities, contracting, building and landscape gardening. For more details write Consumer Relations Dept., International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill., or circle **No. 11-21** on the reply card.

Front-End Loader By Thew

Thew's new Moto-Loader is a 4-wheel drive, 1¾-yd. capacity unit, designated Model ML-153. It has Allison "Torqmatic", 3-speed power-shifted, full reversing transmission and integral torque converter with a 2.5 to 1 ratio and a top speed of 21 mph. Two adjacent foot pedals —one for forward travel and one for reverse—give the operator instant direction control. Another feature is the automatic disengagement of the transmission when the foot controlled service brakes are applied. When the brakes are released, the transmission automatically returns to the gear range in which the loader has been working. Forward reach is 7 ft., dumping height is 40 ins. and the peak lift capacity is 11,000 lbs. at 0 mph with a carrying capacity of 6,000 lbs. at 4 mph. A line of easily mounted front-end attachments is available. For full details write The Thew Shovel Co., Lorain, O., or circle **No. 11-19.**

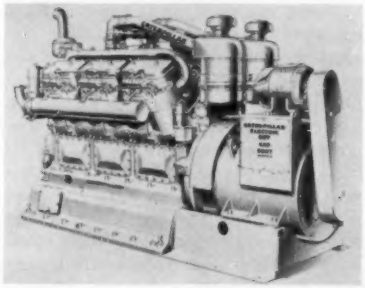
Thew rubber-tired front-end loaders are four-wheel drives

International pick-up trucks will handle a full ton load

"Tynex" Filament In Street Sweeping Broom

"Tynex" nylon filament for street sweeping brooms is announced by du Pont. The filament is a non-standard material of 0.075-in. nominal diameter cut to lengths of 24 inches (for use in strip brushes) or 26 inches (for use in cable-wrapped brooms). It is in natural (off-white) color and is packaged loose in cartons holding approximately 50 lbs. It is unaffected by water, gasoline, grease or other matter commonly encountered in sweeping streets and it is not necessary to pre-treat "Tynex" with water before using. A broom containing this filament can sweep 4000 street-miles, barring misuse or accidents. For full details write Polychemicals Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., or circle **No. 11-22** on the reply card.

Electric Set By Caterpillar



Spark-ignition electric generator set

A new electric set, combining high output and compactness, has been introduced in the form of the Cat D397 spark-ignition electric set. The set is rated at 250 KW and power is provided by the V-type, D397 diesel engine, equipped with simple alterations for fuel carburetion and magneto ignition system, allowing the set to operate on methane, butane, propane or field gases. The self-regulated, constant-voltage generator produces 60-cycle three-phase current at a choice of 240, 480 or 2400 volts at 1200 rpm. Air, direct electric or gasoline engine starting systems are available. For further information write Caterpillar News Service, Caterpillar Tractor Co., Peoria, Ill., or circle **No. 11-23** on the reply card.

Rotary Mower For Roadside Maintenance

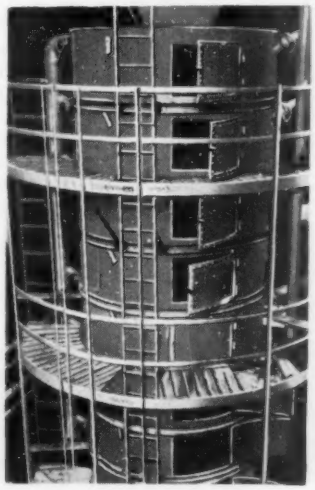
A new 58-in. cut rotary mower for use with the John Deere 420 tractor has been announced by Danuser Machine Works. Designed

Rotary mower will cut a 60-in. swath

for state highway departments, municipalities, turnpikes, counties and airports, the model D-420 Danco rotary mower is center-mounted which allows greater stability and easy maneuverability over rough terrain. The center-mounting also allows the operator to mow on steep slopes and assures a low center of gravity. The unit can be removed in 20 minutes. Adjustable tread wide front axle and power take off are the only tractor equipment required. More details may be obtained from Danuser Machine Works, Inc., Box 5095, Tulsa, Okla., or circle **No. 11-24** on the reply card.

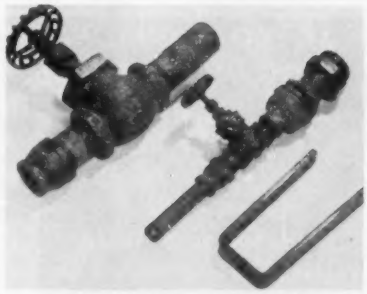
Continuous-Flow Waste Digester

The automatic Earp-Thomas Continuous-Flow Digester, perfected and patented by Dr. George H. Earp-Thomas, utilizes strains of pure bacterial cultures to convert garbage and other organic wastes into granular, odorless, sanitary humus by continuous output at a faster rate than through other composting methods. A digester, 30 ft. in height by 22 ft. in diameter, converts, by continuous flow, 50 tons of waste daily into high grade compost. The unit consists of a vertical



cylinder divided into 8 horizontal sections, each internally fitted with a rotating plow mechanism propelled by a central drive shaft. An aperture in the floor of each section provides for gravitational fall of material to the next lower section until the exit level is reached. Each section is further equipped with thermostatic controls and exhaust dampers for creation and maintenance of the necessary optimum environment. Waste, inoculated with bacteria, is introduced to the top section through a hopper. Humus thus produced is salable as a valuable commodity. For further details write Earp Laboratories, Dept. P, High Bridge, N. J., or circle **No. 11-25** on the reply card.

Concrete Dissolvent



The before and after of using Disolvex

Successful formulation of a liquid dissolvent for hardened concrete is announced by Industrial Synthetics Corp. Disolvex is a chemically compounded concentrate of organic and inorganic synthetics which work on the binding elements in the concrete. It works by catalytic action and starts to act immediately on contact. The chemical comes in concentrated form and will work on any known mix of concrete, no matter how old it is, excepting concrete mixed with rubber. It must be used as a bath, with the liquid surrounding the objects at all times. It has no effect on metals except aluminum, zinc or magnesium. For more data write Industrial Synthetics Corp., 2000 West Walnut St., Chicago, Ill., or circle **No. 11-26** on the reply card.

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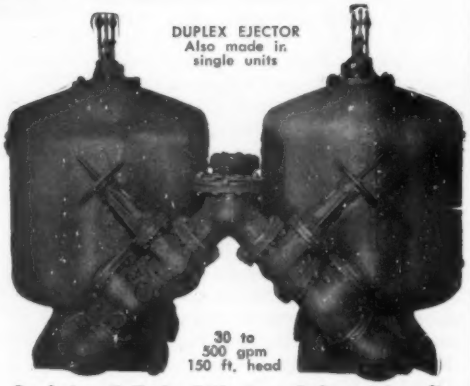

Send for Bulletin S-55. It includes piping diagrams for electrode and float switch controls, plus dimensions and layouts. A book for modern municipal engineers. Interesting and helpful. Write for your copy today.

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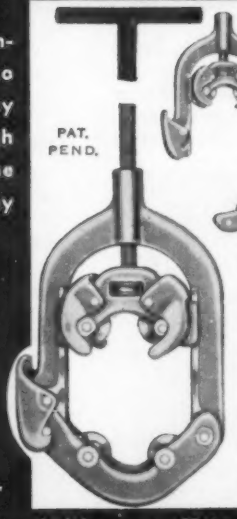
IF YOU CUT LARGE DIAMETER PIPE . . .
YOU NEED THESE
New REED HINGED 4-WHEEL PIPE CUTTERS
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.



Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

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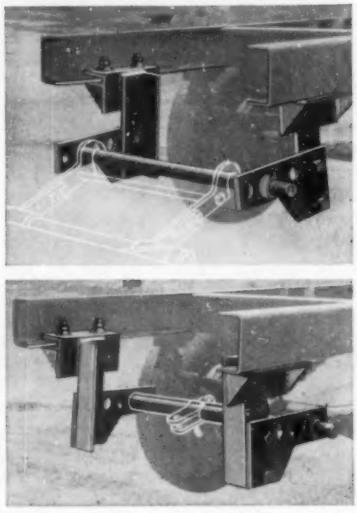
Quick-Mount Truck Hitch



Hitch can fit double-hitch equipment

The Quick-Mount truck hitch is easily and quickly attached to practically any standard dump truck without the need of drilling, cutting or welding the truck chassis. The slotted attaching plates are easily slipped over the chassis frame channel flanges and securely locked in place by simply tightening four heavy set screws and lock nuts. It has eight position adjustments—making it possible to vary the distance between the truck and piece of towed equipment. The wide towing bar will accommodate equipment with two hitches—such as bituminous pavers and spreaders which must be towed in perfect alinement with the truck. For complete information write The Burch Corp., 326 S. Thoman St., Crestline, O., or circle **No. 11-27** on the reply card.

Triple Wet Tube Dust Washer For Asphalt Plants

A new triple wet tube dust washer for the purpose of dust abatement and air washing of asphalt plant dryer exhaust to meet requirements of air pollution control has been announced by Madsen Works. Internal construction of this air washer is unique and substantial to withstand the corrosive effect of the dilute acids resulting from fuel combustion. The washer is readily serviced through large manholes in the ends with sprinkler manifolds easily removed in one assembly, assuring easy maintenance. Water control to each unit tube is arranged from a central valve unit. Sludge removal is provided at the base of the stack though a 6-in. diameter outlet so that the sludge may be

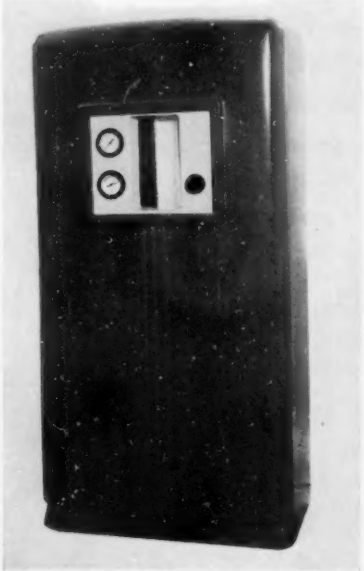
piped off to a drain tile and settling pit. Complete information and engineering details from Madsen Works, Baldwin - Lima - Hamilton Corp., 14120 East Rosecrans Ave., P. O. Box 38, La Mirada, Calif., or circle **No. 11-28** on the reply card.

Landscape Scarifier And Rake

A new scarifying and raking tool for use by landscape and maintenance departments in preparing lawn and turf seed beds has been announced by the Roseman Tractor Equipment Co. This tool, equipped to fit the IHC and Cub Lo-Boy equipped with one point fast hitch, does four lawn seed bed preparation operations in one. Badly rutted, compacted or hard ground is scarified and aerated by a front row of scarifying teeth, then the soil is levelled and graded by the blade member and pulverized by the heavy rake bar, and finish raked into a perfect seed bed all with the same implement and in the shortest possible time. Spreading gravel; renovating fire lanes; and reconditioning bridle paths, school cinder running tracks, parking lots and ball fields are additional uses. Complete information from Roseman Tractor Equipment Co., 2606 Crawford Ave., Evanston, Ill., or circle **No. 11-29** on the reply card.

Chlorinator Feeds Up To 8000 Pounds Per Day

The addition of a new chlorinator to their line of V-notch equipment has been announced by Wallace & Tiernan. The chlorinator can meter and feed up to 8000 lbs. of chlorine per 24 hrs. The Series A-721 is adaptable to any type of chlorinator control and the feed rate may be adjusted manually or controlled automatically on a flow proportional or selective rate basis. The unit is constructed of plastic materials for corrosion resistance and vacuum operation assures safety for plant personnel and equipment. Complete information from Wallace & Tiernan Inc., Belleville, N. J., or circle **No. 11-30** on the reply card.



V-notch chlorinator for water plants

"Somat" Reduces Garbage to Pulp-Like Fertilizer

The "Somat" system offers a means of reducing garbage or mixed refuse to a uniform material that can be utilized as an organic fertilizer and mulch. Only bulky metal objects, tires, rugs and the like need be removed before the refuse is processed. The unit consists of a grinder tank with a large impeller at the bottom. Rapid rotation of this impeller, which has pieces of tungsten carbide imbedded in the face, reduces garbage and paper material to a fine pulp. This is pumped to an extractor which removes excess water and discharges the crumbled pulp into a truck. Tin cans and other objects which are not ground up are removed by a de-junker. The processed pulp, called FAM, is said to break down and lose its bulk quickly when spread in light layers on the ground where it acts as a fertilizer and mulch. A pilot demonstration of the "Somat" unit currently being operated in Philadelphia can handle up to 20 tons of garbage per day. Much larger machines are available. "Somat" is made by Wandel Machine Co., Inc., Pomeroy, Pa. For more details circle **No. 11-31** on the reply card.

Asphalt Containing Neoprene

Asphalt containing neoprene synthetic rubber may substantially lengthen the life of surface treated roads and at the same time provide safer driving conditions and cut maintenance costs. In current field tests in Pennsylvania, Michigan, New Jersey, Delaware and Oklahoma, the material is laid side-by-side with untreated asphalt so both surfaces will be exposed to identical wear. Photos are taken when the surface is applied and the strips are inspected at regular intervals. Close-ups are made of spots where unusual wear is expected. The work is being done by Du Pont chemists with the cooperation of highway departments of the 5 states.

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PUBLIC HEALTH ENGINEER I—$5527 per year. Civil Service continuous testing. Requirements: Bachelor's Degree in Engineering. Applications from Personnel Officer, Department of Public Health, Room 504, City Hall Annex, Philadelphia 7, Pennsylvania.

PUBLIC HEALTH ENGINEER II—$6074-7605. Civil Service continuous testing. Requirements: Bachelor's Degree in Engineering plus two years experience in Industrial Hygiene, Combustion Control or Public Health Engineering or combination thereof. Applications from Personnel Officer, Department of Public Health, Room 504, City Hall Annex, Philadelphia 7, Pennsylvania.

PUBLIC HEALTH ENGINEER III (Sanitary)— $7605-9551. Civil service continuous testing. Bachelor's Degree in Engineering; Sanitary Civil, Mechanical, plus three years experience in Industrial Hygiene, Combustion Control, Air Pollution Control or combination thereof, including one year in a supervisory capacity. Closing date for applications—November 13, 1957.

Address applications to:

Personnel Officer
Department of Public Health
Room 504
City Hall Annex
Philadelphia 7, Pennsylvania

ENGINEER WANTED

Licensed engineer is wanted to head public works department in city of 10,000 population. Municipal public works experience required. Salary $450-$550 per month. 5 day week.

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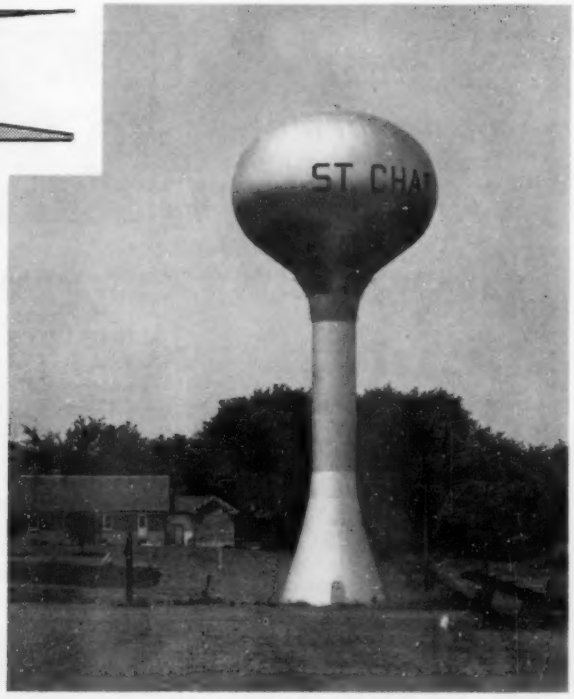
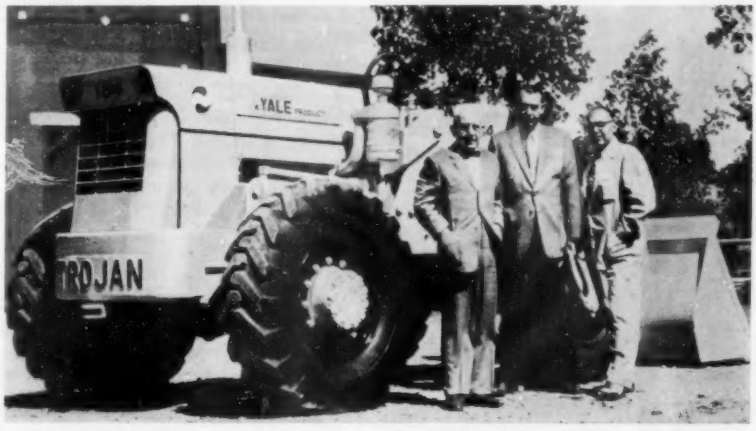
—Worth Seeing

What's a 20-inch diameter tree to an International TD-18 tractor? Practically nothing! This machine, owned by the Rutherford County, Tennessee, highway department, is busy cutting 10 feet to grade on a 5-mile rural road improvement.



Beauty in elevated water tanks is no idle dream; witness this 300,000-gallon Waterspheroid built for the City of St. Charles, Illinois, by the Chicago Bridge & Iron Company. Needed water storage and better distribution pressure is another asset.

Contractors Machinery Division of the Yale & Towne Mfg. Co. proudly presents a member of their new Trojan line of Tractor-Shovels beside members of its founding family, the 3 Allans, Frederick W., Robert G. and Fred, Jr. of Batavia, up in northern New York.



Humor helps publicize Chicago's clean-up drive. It features "Sweeper Sam" and his galvanized steel covered garbage can of which 50,000 more are needed. 5,000 additional wire litter baskets will augment the 15,000 already doing anti-litter service on the streets.

a guarantee of performance:

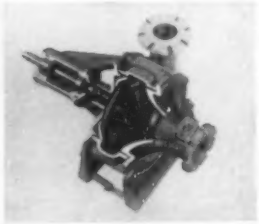
You can't clog a liquid impeller!

There is no clogging problem, because there is nothing to clog. Pumping action is caused by a *liquid* impeller, a swirling vortex of fluid.

- No constrictive impeller eye
- No constrictive discharge ports
- No wearing rings

Material flows completely unobstructed, from suction to discharge flange.

Write for complete details on the Wemco torque-flow Solids Pump and its amazing principle of operation.



WEMCO
TORQUE-FLOW
SOLIDS
PUMP

WESTERN MACHINERY COMPANY
650 FIFTH STREET
SAN FRANCISCO 7, CALIF.

by Arthur K. Akers

★ HOWARD F. BARROWS retires Nov. 1 as Advertising and Sales Promotion Manager, Austin-Western, Construction Equipment Division, Aurora, Ill. Mr. Barrows has been prominent in industrial advertising circles for over 35 years, and was among the first to use sound color movies in such advertising. He will continue active in soil conservation matters, a long-time interest of his.

Mr. Barrows

Mr. Reichel

★ KEASBEY & MATTISON CO. appoint James R. Reichel District Manager in San Francisco, succeeding John H. Watrous, retired. The company has a large water and sewer pipe factory at Santa Clara, Calif.

★ UNITED STATES PIPE & FOUNDRY CO., Birmingham, has opened a Baltimore sales office, in charge of Kenneth E. Cooper. Other changes are: Bartlett G. Bretz from Kansas City to Chicago offices; Buddy P. Amis from Houston to Kansas City. Hoyt N. Burns of Birmingham succeeds him in Houston. George J. Bogs is promoted from Sales Agent to Ass't. Pacific Coast Sales Manager, at Los Angeles.

★ U. S. STEEL CORP. has a new film, "Jonah and the Highway," aimed at the general public and dealing with the highway engineer and his job. First showing was at the ASCE Convention in New York October 15.

★ JAMES TERHUNE has joined the sales staff of the Ludlow Valve Mfg. Co., assisting G. Kenneth Sinkinson in the New York City area.

★ LINK-BELT CO. has moved into its new Los Angeles plant, in Montebello, Calif. This doubles Link-Belt's manufacturing facilities in that area, serving southern California and Nevada and all of Arizona.

★ KOMLINE-SANDERSON ENGINEERING CORP., Peapack, N. J., announce formation of four divisions in connection with their program of diversification and expansion. Eugene H. Trubnick will head the Sanitary Engineering Division, including the Coilfilter. Ralph F. Conte, formerly Vice President of Blackburn - Smith Mfg. Co., will head the Mechanical Equipment Division, including pneumatic ejectors, sludge pumps, chemical feed pumps, prefabricated sewage treatment plants, and Meider Collectors.

★ ANDREW W. ROSE is elected Vice President, Byron Jackson Division, Borg-Warner Corporation, and appointed Assistant to the President. This is one of the top executive posts within the Byron Jackson Division.

Mr. Rose

Mr. Thompson

★ NELSON THOMPSON, Vice President, Sales, of Homelite, a Division of Textron Inc., Port Chester, N. Y., will now fill the newly-created position of Executive Vice President. He joined the company in 1929 as a salesman.

★ "I CLEAN MY DIAMONDS with ammonia," said the new-rich woman, out to make an impression.

"I don't clean mine," the quiet woman next to her counter-attacked. "When they get dirty I just throw them away."

How to select the right flow-measuring device

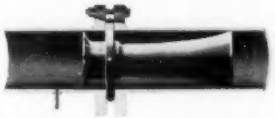
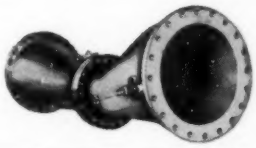
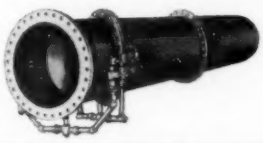
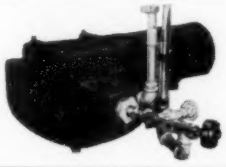
Selecting the correct device is simply a matter of choosing the one that best meets your requirements. The wide variety of Simplex Primary Elements makes this selection easy.

This table shows you which of Simplex's standard elements performs best under various flow conditions. (Not shown are Simplex primary devices of steel or concrete, designed to meet the physical limitations on special jobs.)

SIMPLEX VENTURI TUBES produce a minimum head loss—returning 85% to 90% of the differential head developed for meter operation. Since pressure differentials are measured between the main and throat sections, the tubes are smooth, true in shape and of accurate diameters to produce a stable coefficient of discharge. This gives you accuracy over wide flow ranges . . . accuracy within ±0.3% if required.

Write for Technical Bulletins. Simplex Valve & Meter Co., Dept.PW-11 7 East Orange Street, Lancaster, Pa.

SIMPLEX®
VALVE AND METER COMPANY
VENTURI TUBES • FLUMES • METERS • GAUGES
TRANSMITTERS • CONTROLLERS • TABLES • AIR VALVES

FLOW CONDITION		SOLUTION
NORMAL WATER, AIR OR GAS FLOWS		TYPE VT—STANDARD VENTURI TUBES Cast iron with bronze bushed main piezometer holes and bronze throat liner. Flanged, bell or spigot ends. Inspection opening at throat. Special metals for high pressures or caustic liquors, corrosive gases, brines, etc. BULLETIN 005
NORMAL WATER, AIR OR GAS FLOWS		TYPE TG—INSERT TUBES AND NOZZLES Withstand high pressures. Fit inside existing lines . . . permitting light construction. This, plus *short length*, cuts costs. BULLETIN 100
SMALL FLOWS OF WATER, GASES CORROSIVE FLUIDS		TYPE TF—MINIATURE VENTURI TUBES Machining to .0005" assures accuracy. Main diameters as low as ½"; throat diameters down to .1". Welded stainless steel models for high pressures. BROCHURE
NORMAL SEWAGE, SLUDGE, TRADE WASTES		TYPE VTJ—SINGLE TAP VENTURI TUBES Single taps at main and throat have bayonet-type valve for fast cleaning. Absence of pressure belts prevents clogging. Inspection opening at throat. BULLETIN 005
NORMAL SEWAGE, SLUDGE, TRADE WASTES		TYPE VS—FOUR TAP VENTURI TUBES Four cleaning valves at main and throat can be operated manually, by air, or hydraulically to keep piezometer holes clear for top accuracy. Two hand holes on each pressure belt and inspection opening at throat. BULLETIN 005
LOW-VELOCITY SEWAGE, HEAVY WASTES		TYPE VE—ELLIPTICAL VENTURI TUBES Developed specifically to accurately measure low-velocity sewage, sludge and heavy trade wastes—under low pressures. *Flat top* prevents air binding. *Flat bottom* is self-scouring. Inspection opening at throat. BROCHURE
LOW-HEAD SEWAGE, SLUDGE, TRADE WASTES		TYPE S—PARABOLIC FLUMES Full 20:1 range for open flows. Accuracy ±2%. Flanged, bell or spigot inlet for 6 to 36" lines. Integral sediment trap, piezometer reamer, gauge glass, direct-reading flow scale. BULLETIN 801

When you plan your new facilities, include W & T Equipment, both Chlorinators and Dry Chemical Feeders.

"... this is where we plan to put the W&T Dry Chemical Feeders."

When you plan your new plant or the expansion of your present one, be sure to plan a place for W&T Dry Chemical Feeders as well as Chlorinators. W&T Feeders are used for every type of dry feeding problem found in water and sewage treatment plants.

W&T makes both volumetric (volume measurement) and gravimetric (weight measurement) feeders. There is a feeder for any size job, from small equipment to measure out ounces, to accurate giants capable of handling thousands of pounds per minute.

To find out more about W&T Dry Chemical Feeders, write for bulletin S-120. Or let us know the type of feeder problem you have, so we may send publications describing the W&T equipment best suited for your job.

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY